ABSTRACT

"Neither Tonal nor Atonal"?: Harmony and Harmonic Syntax in
György Ligeti's Late Triadic Works

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A number of works from the latter part of György Ligeti's career are saturated by major and minor triads and other tertian harmonies. Chief among them are *Hungarian Rock* (1978), *Passacaglia ungherese* (1978), "Fanfares" (Étude no. 4 for piano, 1985), and the last three movements of *Síppal, dobbal, nádihegedűvel* (2000). Ligeti claims that his triadic structures are "neither 'avant-garde' nor 'traditional,' neither tonal nor atonal," and analysts commonly characterize these pieces as making use of the "vocabulary" but not the "syntax" of tonal music. The most prolific of these analysts refers to Ligeti's triads as "context-free atonal harmony . . . without a sense of harmonic function or a sense of history" (Searby 2010, p. 24). However, to date, no detailed analysis of Ligeti's triadic sequences has been presented in support of these claims. This dissertation seeks to provide such an analysis in evaluation of these claims.

This dissertation takes as its analytical starting point a definition of harmonic syntax based largely on the writings of Leonard Meyer and Aniruddh D. Patel: harmonic syntax involves principles or norms governing the combination of chords into successions with those chords, or the kinds of progressions between them, being categorized into at least two categories of stability and instability. With this definition in mind, this dissertation explores the six movements named above, seeking to answer two primary research questions: 1) do these works present what we might call harmonic syntactic structures?; and 2) to what extent are those syntactic structures based in tonal procedures?

Chapter 2 presents a statistical analysis of the triadic structures of the six most heavily triadic works from the latter part of Ligeti's career, comparing the results to analyses of two tonal corpora. This analysis provides evidence of meaningful, non-random structure to the ordering of Ligeti's harmonic successions in these movements, as well as significant relationships between the structures of these movements and the representative tonal works. Specifically, Ligeti's late triadic pieces evidence guiding principles for the ordering of chords into successions, and there is reason to believe that these principles may have their foundation—at least in part—in tonal harmonic practice. Further analysis is required to find categories of stability and instability, or to establish a link of more than correlation between Ligeti's structures and those of tonal practice. The results of this study also raise specific questions about the harmonic structures of individual movements, to be explored in subsequent analysis.

Chapters 3–5 explores these questions and other features of the harmonic structures of these six movements through direct analysis of the scores of these movements and, where appropriate and available, the precompositional sketches preserved for these movements. The analyses of Chapters 3–5 confirm the conclusion of Chapter 2 that there are meaningful syntactic structures in these movements. Both principles for the ordering of chords into successions and categories of stability and instability can be found in these movements, though these principles and categories are not the same for each movement.

In sum, we can say with confidence that in these six movements, Ligeti composed meaningful harmonic successions, that those successions can be said to be syntactic, that the structures of those successions and the properties of those syntaxes have a strong relationship with some fundamental aspects of the successions and syntax of common-practice tonal music, that Ligeti was aware of that relationship, that Ligeti intended that relationship,

and that understanding that relationship is fundamental to understanding the harmonic and formal structures of these works.

Chapter 6 explores the conflict between this conclusion and Ligeti's pronouncement that his triadic music is "neither tonal nor atonal." Ligeti's use of *both* tonal and atonal elements in his late music can be seen in large part as a response to problems about form and syntax that arose within the serialist tradition, which Ligeti has been addressing in his compositions and articles since the late 1950s. In the latter part of his career, in spite of the fact that he continues to write music in line with his earlier writings on form and syntax, Ligeti desires to be seen as a "late" composer—both in terms of his own career, and in terms of the broader history of music. Thus, while composing music that draws heavily on both tonal and atonal musics of the past, he shifts his rhetoric and states that his music is "neither tonal nor atonal." The tension between these two strains in his output is fundamental to a complete, nuanced understanding of Ligeti's music and aesthetic ideology.

"Neither Tonal nor Atonal"?:
Harmony and Harmonic Syntax in György Ligeti's Late Triadic Works

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for Ciaran and Finn

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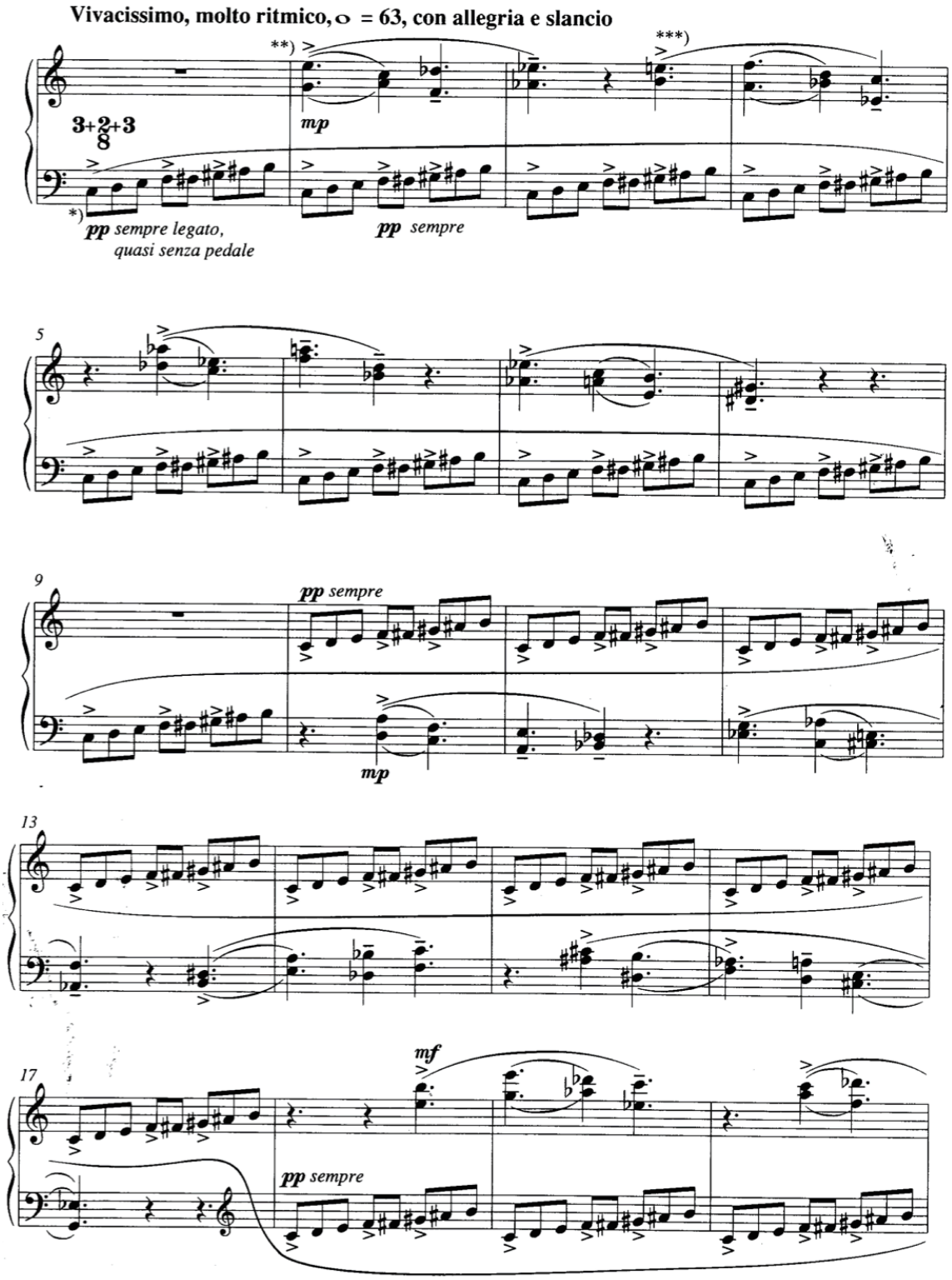
Figure 1.1. Mm. 1–20 of “Fanfares.”



I. "NEITHER TONAL NOR ATONAL"?

Consider the opening of György Ligeti's fourth Étude for piano, "Fanfares," published in 1985 (figure 1.1). One of the most salient features of this passage is that it is heavily triadic. Where melody and accompaniment intersect, the result is always a major or minor triad. Even as the movement progresses in time and increases in contrapuntal and harmonic complexity, the harmonic results are still primarily tertian—triads, seventh chords, added-ninth chords, and the like. However, it is also readily apparent, even from this brief passage, that phrases and larger formal divisions are not articulated by typical tonal cadences. Indeed, even an unambiguous tonic is hard to find in Ligeti's late triadic works, and when one does appear, it is short-lived. What, then, do we as analysts and critics do with these successions of triads?

Ligeti, himself, seeks to provide us with some assistance in our quest to make sense of these harmonic successions and others like them. In an interview from 1986, soon after the publication of "Fanfares," Ligeti states:

> [W]hat I am doing now is neither "modern" nor "postmodern" but something else. . . . I don't want to go back to tonality or to expressionism or all the "neo" and retrograde movements which exist everywhere. I wanted to find my own way and I finally found it. . . . I have found certain complex possibilities in rhythm and new possibilities in harmony which are neither tonal nor atonal (Dufallo, pp. 334–35).

This neither/nor positioning is a recurring theme in Ligeti's words about his own music, particularly in the latter part of his career, as Charles Wilson has explored at length in his 2004 article, "György Ligeti and the Rhetoric of Autonomy." Wilson sees this as a rather commonplace technique by which composers seek to differentiate themselves from "an otherwise impersonal and overcrowded market" (p. 13); and, Ligeti was particularly adept at it. Wilson notes the great success Ligeti had in laying out the terms according to which his

works would be received, as well as the terminology with which his works would be analyzed. As a result, Ligeti has wielded enormous influence over the way his works are interpreted, even for scholars who read Ligeti's words with a critical eye.

This can be seen in the way that this quotation and other like it have influenced the way that Ligeti's use of the triad in his later works has been interpreted by the scholarly community. Stephen Taylor, Eric Drott, Richard Steinitz, and Michael Searby have published substantial analyses of the harmonic structures of movements or passages by Ligeti that are heavily triadic. Though they express it with greater or lesser degrees of nuance, all repeat the same mantra: in his successions of triads and other tertian sonorities, Ligeti uses "the vocabulary but not the syntax of tonal music" (Searby 2001, p. 18). That is, by using the verticalities of the tonal musical language and the horizontal patterns of atonal music, Ligeti finds his "own way" into music that is "neither tonal nor atonal," but completely Ligeti. Steinitz calls Ligeti's triads an "incidental byproduct" of other, non-harmonic processes ("The Dynamics of Disorder," 1996, p. 11). Searby, who writes the most about this topic, states that in Ligeti's music, triads are "essentially coloristic" (2010, p. 18), "context-free" (p. 24), "atonal" (p. 24), tonally "isolated" (p. 104), and lacking "a sense of harmonic function or a sense of history" (p. 24).

However, none of these authors support this interpretation with a detailed analysis of Ligeti's harmonic successions. Drott (2003) makes a strong argument that in some of Ligeti's triadic passages, Ligeti minimizes the perceptible syntactic claims that chords or chord progressions may be making by means of linear devices; that is, Ligeti uses melodic patterns that draw the listener's attention away from harmonic considerations. However, to support the claim that tonal syntactic structures are absent from Ligeti's triadic successions, Drott simply quotes Searby. Searby, in turn, supports this claim not with analytical data, but with

quotations of Ligeti like the one I cited earlier (Searby 1997, p. 11; 2001, p. 19; 2010. p. 11ff.). For instance, in Searby's (2010) analysis of *Passacaglia ungherese*, he provides a table of "occurrences of triads generated from dyads in *Passacaglia ungherese*" (p. 105). This table takes each dyad of the ground and gives the number of times a given triad (which, for Searby, includes seventh chords) occurs. For example, the C/E dyad with C in the upper voice is completed four times as a C-major triad and four times as an A-minor triad; when the voices invert and E is in the upper voice, the C/E dyad is completed as C major three times, A minor five times, and C dominant-seventh one time. Such attention to statistical detail in his analysis of Ligeti's use of triads and other tertian chords draws significant attention to the *absence* of such detail in analyzing the chord-to-chord progressions. In light of this, Searby's statement that "the detail of the music [of *Passacaglia ungherese*] ensures that no 'fully realized' tonal perfect cadence occurs; therefore the triads that Ligeti creates are isolated in a tonal sense" (p. 104), functions not as an analytical conclusion, but an analytical premise. That is, the statement is not based on any published analysis of the chord progressions in this work, but rather provides the framework for Searby's subsequent analysis—analysis that includes a detailed statistical study of the triads generated by the dyads of the ground, but does not include any such analysis of the chord-to-chord progressions. By contrast, both the introductory material to this analysis (p. 101ff.) and the conclusion of the analysis of the *Passacaglia* and *Hungarian Rock* are densely populated with quotations of Ligeti. It is these statements that drive the analysis and the conclusion, not the analytical data.

Taylor—whose dissertation is the earliest published instance of the tonal-vocabulary-but-not-syntax interpretation—likewise, bases his claim on statements made by Ligeti (1994, p. 147):

> "I am trying to develop a harmony and melody which are no genuine return to tonality, which are neither tonal nor atonal but rather something else, above all in connection with a very high degree of rhythmic and metric complexity." [quoted from Bossin 1984, p. 238] Without a "genuine" return to tonality, Ligeti can use the vocabulary—but not the syntax, the grammatical rules—of the nineteenth century to achieve the "neither tonal nor atonal effect" which defines his outsider, anti-establishment stance (ibid.).

These statements about Ligeti using the "vocabulary" but not the "syntax" of tonal music are, thus, an example of the intentional fallacy, basing their conclusions about the structural properties of Ligeti's works on his words rather than on analytical data. This, then, leaves the analytical question open: how can we as analysts make sense of and interpret Ligeti's works that make substantial use of the "tonal" triad? In this dissertation, I will analyze the harmonic structures of six movements from late in Ligeti's career that are heavily triadic throughout: *Hungarian Rock* and *Passacaglia ungherese* (both composed for harpsichord in 1978), "Fanfares," and the last three movements of *Síppal, dobbal, nádihegedűvel*. These are all of the movements from the 1970s and beyond that are composed primarily of tertian sonorities for the entirety of the movements.[1] This analysis seeks to answer two questions: 1) do these works present what we might call harmonic syntactic structures?; and 2) to what extent are those syntactic structures based in tonal procedures?

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[1] There is a significant gap in time between the three keyboard pieces of 1978–1985 and the three movements of *Síppal, dobbal, nádihegedűvel* (2000). However, this does not mean that Ligeti abandoned his engagement with consonant harmony and harmonic syntax during this time. Rather, there are a number of works that contain brief triadic passages or occasional use of tertian sonorities throughout the work, both before 1978 and between 1985 and 2000. Such works include *Clocks and Clouds* (1973), *Le grand macabre* (1977/96), the Horn Trio (1982), the *Hommage à Hilding Rosenberg* (1982), other Études for piano besides "Fanfares" (esp. in book 1, 1985), the Piano Concerto (1986/88), the *Nonsense Madrigals* (1988–93, esp. "Flying Robert"), and the Violin Concerto (1993). I have elected to focus my attention in this dissertation on complete movements that are heavily or primarily based on tertian harmonies, in order to have large samples of chords and progressions to analyze. This, hopefully, leads to the most detailed, nuanced, and comprehensive understanding of Ligeti's use of tertian chords and root progressions in his later music. This also, hopefully, leads to an understanding that will work as a helpful starting point for analyzing the shorter, more isolated, more singular triadic passages in Ligeti's other later works.

Before addressing these questions, however, it is necessary to establish a working definition of harmonic syntax. Searby (2010, pp. 11–24), in explaining his tonal-vocabulary-but-not-tonal-syntax argument, puts forward the conception of harmonic syntax at the base of that argument. Searby equates tonal syntax with functional harmonic progressions, which he defines as progressions that establish a clear tonal center. Further, for Searby, the clear confirmation of a tonal center is not only bound up definitively with tonal syntax, but with tonality itself (and that the absence of such clear confirmation renders a work fundamentally atonal—on p. 156, Searby claims this to be the normative use of the term *atonality*). By binding up harmonic function and syntax with the articulation of a tonal center, he necessarily binds up the lack of a clearly articulated tonal center (atonality) with the lack of harmonic function. The result, for Searby, is that any music or passage without a clear tonal center is *atonal*, and that in atonal music, any use of consonant, triadic, *tonal* harmonies is "essentially coloristic" (p. 18), rather than functional. Thus, from the late 1970s on, when Ligeti uses triads, he is writing fundamentally atonal music, devoid of functional harmonic progressions, but now with an expanded harmonic palette that is no longer constrained to harmonic dissonance.

Essentially, Searby is claiming that while tonal vocabulary (triads and other consonant harmonic sonorities) can be used outside of tonality., apart from a clearly articulated tonal center), functional or syntactic harmonic progressions cannot. By virtue of including a consonant triad in an atonal context (one lacking a clear tonal center), it is stripped of its functional, syntactic, and historical claims; its difference from dissonant harmonic sonorities is merely coloristic.[2]

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[2] He is not alone in making such a claim. Kostka and Payne (2000), for example, write that in atonal music—exemplified by Schoenberg's Op. 11, No. 1—it is possible to find "tonal structures" such as a triad or seventh chord, but that "they lose their identities when placed in this atonal setting" (p. 529).

This definition of harmonic syntax—that harmonic progressions can be said to be syntactic only if the harmonies work together in such a way that a tonal center is clearly established[3]—is not universal. In fact, numerous scholars define syntax in such a way that it is possible to conceive of harmonic syntax in music that lacks a clear tonal center. Further, when tonal harmonic sonorities are employed in atonal contexts, they bring with them syntactic implications and historical associations from the norms of tonal harmonic practice.

For instance, both Aniruddh D. Patel (2008) and Leonard Meyer (1989) define syntax in a way that does not require a tonal center. Patel writes:

> In this chapter, syntax in music (just as in language) refers to the principles governing the combination of discrete structural elements into sequences. The vast majority of the world's music is syntactic, meaning that one can identify both perceptually discrete elements (such as tones with distinct pitches or drum sounds with distinct timbres) and norms for the combination of these elements into sequences. . . . The cognitive significance of the norms is that they become internalized by listeners, who develop expectations that influence how they hear music. Thus the study of syntax deals not only with structural principles but also with the resulting implicit knowledge a listener uses to organize musical sounds into coherent patterns (pp. 241–42).

This definition of syntax does not take the concept of a tonal center as a given, nor a hierarchy of pre-established pitch/interval relationships, nor even that syntax need be predominately a pitch phenomenon ("tones with distinct pitches *or drum sounds with distinct timbres*"); syntax involves the governing principles of sequences of musical materials in time. Further, where Patel does speak of harmonic syntax as being predicated on a tonal center later in the chapter, he makes it clear that he is speaking of common-practice-period Western tonal music as an example, the specific properties of which are not necessarily universal.

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[3] It is important to stress that Searby actually does claim a Boolean choice between tonal-syntactic progressions, on the one hand, and functionless progressions of "essentially coloristic" chords within a "fundamentally atonal" context, on the other hand. Though he talks extensively about—and titles one of his articles—"Ligeti's 'Third Way,'" his abstract discussions of harmony and syntax leave no room for music that is "neither tonal [or at least, centric] nor atonal."

Meyer does not give as concise a definition of syntax as Patel, but he provides more detail into what he believes are the necessary criteria for a musical syntactic system, according to the constraints and universals of human cognition. He writes:

> In order for syntax to exist (and syntax usually differs from one culture and one period to another), successive stimuli must be related to one another in such a way that specific criteria for mobility and closure are established. Such criteria can be established only if the elements of the parameter can be segmented into discrete, nonuniform relationships so that the similarities and differences between them are definable, constant, and proportional (p. 14).

Again, a tonal center is not a prerequisite, nor need syntax be primarily a pitch phenomenon. What is required for Meyer—as for Patel—is some musical parameter (or parameters) of discrete categorical elements that are arranged in sequences according to established norms. Of additional importance here (though also noted by Patel, p. 256) is the ability and necessity of such parameters to provide mobility and closure (tension and resolution), and Meyer then provides his list of potential musical parameters that can and cannot do that, according to his study of music perception and cognition.

Even for much music of the common-practice period, which we retrospectively analyze as being governed by a tonal center—it can be problematic to attribute tonality, or tonic-centeredness, to the composer's conception of that music. Yet, it is nonetheless syntactic and can be interpreted as exhibiting a robust harmonic hierarchy. Robert Gjerdingen, a former student of Leonard Meyer, writes:

> The lodestar of galant music was not a tonic chord but rather a listener's experience, which the masters of this art modulated with consummate skill. The nineteenth-century term *tonality*, which was never used by galant composers, was foreign to their more localized preoccupations (2007, p. 21).

The remainder of Gjerdingen's book is dedicated to laying out a number of *schemata*—stock musical figures, typically shorter than phrase-length, with characteristic musical content and characteristic temporal positions relative to other schemata and within larger formal struc-

tures—common to galant music. These schemata typically contain set harmonic progressions, but are not always tied to specific scale degrees in relation to what we now perceive as the governing tonal center. Rather, some schemata, such as the *monte* or *fonte*, contain definitive intervallic relationships between the harmonies *within* the schema, but can be placed on a number of scale degrees, and even strung together in successions that momentarily defy interpretation in terms of a tonic or scale degrees, provided that the progressions in and out of these schemata from and to the surrounding schemata can be legitimately reckoned against the stylistic norms. Thus, even in music in which we now perceive a governing tonal center, we can find a syntactic system at work that engages harmonic progression but is not predicated on the relationship of each harmony to that tonal center.

Fundamental to Patel's, Meyer's, and Gjerdingen's understanding of musical syntax is the idea of stylistic norms, learned by repeated exposure to the style over time (see above passage from Patel 2008, pp. 241–42). (We can also see similar ideas in works not directly influenced by study in music cognition, like James Hepokoski's and Warren Darcy's *Elements of Sonata Theory: Norms, Types, and Deformations in the Late-Eighteenth-Century Sonata*.) This syntactic knowledge does not require hearing a prototypical exemplar in order to be activated in a listener's mind; rather, both imperfect and incomplete instances of elements of a syntactic system can trigger expectancies and associations in a listener's mind. Patel writes:

> [T]here is a reason to believe that the acquisition of tonal syntax reflects the statistics of a particular musical environment. However, once a musical syntax is acquired, it can be activated by patterns that do not themselves conform to the global statistics that helped form the syntactic knowledge (p. 262).

And further:

> [F]or an experienced listener, even one or two chords can suggest a key, and a melody of single tones can suggest an underlying chord structure (p. 262).

David Huron (2006), Irene Deliège, et al. (1996), and other cognitive musicologists also describe similar phenomena, where listeners hear *cues* in music that call to mind more elaborate schemata or syntactic expectations based on past listening experiences, and subsequent musical events are appraised against those expectations. In other words, even before a tonal center is established by a definitive event, such as a cadence, we can—and unconsciously do—interpret chords in terms of their syntactic function and relationship with surrounding chords. Put more generally, a single tonal chord or short series of chords activates a listener's body of knowledge of tonal syntax and harmonic progression and projects interpretive possibilities on the harmonic events that precede and follow it.

This is not an idea that can only be traced back to 1989, or even to the earlier work of Leonard Meyer; nor is this idea limited to scholars' thoughts on tonal music. Arnold Schoenberg (1926) writes of his atonal music:

> To introduce even a single tonal triad would lead to consequences, and would demand space which is not available within my form. A tonal triad makes claims on what follows, and, retrospectively, on all that has gone before. . . . I believe that to use the consonant chords, too, is not out of the question, as soon as someone has found a technical means of either satisfying or paralysing their formal claims (p. 263).

Pierre Boulez (1971), likewise, writes of the interference of even a single octave or triad with the perception of serial structures. The claims of these theorists, cognitive musicologists, and composers all challenge the idea that a triad in atonal music can be merely "coloristic" and devoid of functional and syntactic significance, that one could make use of tonal vocabulary without engaging established conventions of tonal syntax in some meaningful way.

Summing up this line of thought on harmonic syntax—which will be fundamental to my exploration of harmonic syntax in Ligeti's music, and the potential relationship of Ligeti's harmonic structures to those of common-practice tonal music—we can say the follow-

ing: Syntax in music, whether it involves harmonic or other types of musical structures, "refers to the principles governing the combination of discrete structural elements into sequences." Syntactic structures require "perceptually discrete elements," as well as a set of "norms for the combination of these elements into sequences" (Patel 2008, p. 241), and "successive stimuli must be related to one another in such a way that specific criteria for mobility and closure are established" (Meyer 1989, p. 14). In the realm of harmony, then, we would expect chords to be the discrete elements, and we would expect a syntactic system to have "principles governing the combination of [chords] into sequences" with those chords, or the kinds of progressions between them, being categorized into at least two categories of stability and instability. Further, a composer need not employ the entirety of a syntactic system in order for musical elements to elicit expectations in the minds of listeners according to that syntactic system. In the case of a system as widespread and well entrenched as tonal-harmonic syntax, very little is needed to call to mind a wealth of expectations and associations in the minds of listeners—and composers.

It is helpful to note the claims that Ligeti makes in regard to syntax and the historicity of musical elements. In his article, "On Form in New Music" (1966, tr. Ian Quinn), Ligeti—following the line of thinking of Schoenberg and Boulez, and drawing significantly on Theador Adorno (1960)—writes that the formal function of any musical element is not dependent simply on its position within a sequence of events, or on the associations of elements present within a single work or a single composer's body of work, but it is dependent also on its place in "the all-encompassing referential system of history" (p. 6). The following passages on form, syntax, and function work this out in more detail:

> [A]s each moment enters our consciousness we involuntarily compare it with the moments already experienced, drawing conclusions from these comparisons about moments to come; . . . Generally speaking, it is only the joint ef-

> forts of association, abstraction, memory, and prediction in bringing about a network of relations that enables the conception of musical form (p. 3).
>
> It is not at all possible to explain the function of the constituents of a piece only through the internal musical connections of the work in question: the characteristics of the individual moments, and the linkages [*Verknüpfungen*] among these moments, have meanings only in relation to the general characteristics and linkage-schemata arising out of the body of works in a particular style or tradition. Individual moments make themselves known as such only insofar as they include similarities to and differences from the historically constructed types. . . . Musical syntax is transformed both by history and through history (p. 3).
>
> [F]ormal function . . . can be fully understood not merely within individual pieces, but principally within the chain of history. This entails that musical form is a category superseding individual musical phenomena. Each moment of a work is, on one level, an element of the referential system of the individual form, and on a higher level, an element of the all-encompassing referential system of history (p. 6).

Ligeti's statements in this article about form and syntax are entirely consistent with the claims of Schoenberg, Boulez, the "Meyer school" of music theorists, and the cognitive musicologists mentioned above: namely, for a twentieth-century composer, incorporating a triad, a succession of triads, a tonal cadence, or a baroque or classical large-scale form is a move that makes historical claims and that triggers syntactic and formal associations for the listener, all of which the composer, analyst, and critic ignore at their peril.

Though Ligeti, in 1966, advocates the historicity of the triad and acknowledges the interpretive baggage that the triad brings from tonal music even into atonal contexts, the question remains regarding Ligeti's practice later in his career. Does Ligeti change his mind in the early 1970s and seek to de-contextualize the triad in his music of the late 1970s and beyond? (or was he lying to begin with?) In such a case, we may seek to contrast the effect of the use of the triad—according to Schoenberg, Boulez, Meyer, Patel, etc.—with Ligeti's attempts to treat it as just another atonal harmony (as Searby interprets them), and we could interpret other allusions to tonality as token gestures or ironic comments (as Ligeti claims—c.f. Beyer

1992–93/2000; Lobanova 2002; both cited in Searby 2010, p. 101). Or perhaps Ligeti seeks to de-contextualize the triad by using specific compositional techniques aimed at diminishing the triad's syntactic implications and historical associations. This is in a sense what Schoenberg was looking for, and Eric Drott (2003) makes a strong case that in some of Ligeti's pieces of the late 1970s and later, Ligeti does employ specific compositional techniques that diminish the triad's syntactic effect and allow him to use it free from some of its historical associations. In other words, the effect of the use of the triad described by Schoenberg, et al., is real, and Ligeti is able to achieve the effect described by Searby through compositional savviness. Or, lastly, it is possible that Ligeti engages the syntactic implications and historical associations in a positive way, taking advantage of them and composing in dialogue with them in order to articulate a specific musical form and generate a specific listening experience that draws on the wealth of knowledge of the tonal system that most Western (indeed, most human) listeners possessed in the late 20th century.

But, again, we are getting ahead of ourselves. First, we must establish what harmonic structures exist in Ligeti's triadic music, and *then* seek to interpret them in light of (or in spite of) Ligeti's claims about his music, and about the historical claims made when elements of tonal music are used after the common-practice period. And so we return to the two questions raised earlier regarding Ligeti's triadic works from the latter part of his career: 1) do these works present what we might call harmonic syntactic structures (as defined by Meyer and Patel)?; and 2) to what extent are those syntactic structures based in tonal procedures? Once we have answers to these questions, we can address hermeneutic questions like those hinted at in this introduction.

In this dissertation, I address these questions as follows. In Chapter 2, I perform a statistical analysis of the harmonic structures of Ligeti's late triadic works. Using computer

scripts designed for the project, I take harmonic reductions of *Hungarian Rock*, *Passacaglia ungherese*, "Fanfares," and the last three movements of *Síppal, dobbal, nádihegedűvel*, and I analyze their harmonic content (in terms of chordal roots) and the content of the chord-to-chord progressions (root intervals), comparing the results to analogous data from representative tonal works. In Chapters 3–5, I follow this statistical analysis with more traditional analysis of the scores of these movements—or significant passages therein—alongside Ligeti's precompositional sketches for these works. In the final chapter, I consider the interpretive implications of the results of the analytical work in Chapters 2–5, returning to Ligeti's "neither tonal nor atonal" claims, and considering the broader histories in which these works belong.

II. A STATISTICAL ROOT-MOTION ANALYSIS OF LIGETI'S LATE TRIADIC WORKS

DEFINITIONS AND METHODS

Before focusing on the possible syntactic properties in Ligeti's triadic music, it is helpful to revisit the definitions of harmonic syntax provided in the previous chapter, largely drawn from the work of Aniruddh D. Patel (2008) and Leonard Meyer (1989). In short, for Meyer and Patel, syntax involves some musical parameter (or parameters) of discrete categorical elements that are arranged in sequences according to established norms, with the result of generating a sense of mobility and closure (tension and resolution, instability and stability, etc.). In the realm of harmony, then, we would expect a syntactic system to have "principles governing the combination of [chords] into sequences"[4] (Patel 2008, p. 241) with those chords, or the kinds of progressions between them, being categorized into at least two categories of stability and instability. In common-practice tonal music, the relationship of a chord to the tonic degree of the key has a significant effect on the relative stability of that chord. However, Meyer's and Patel's definitions also allow for syntactic structures that operate outside of a tonal system (indeed, even outside the domain of pitch).

With this understanding of syntax in mind, this chapter will approach from a statistical-analytical perspective the two research questions presented in Chapter 1: 1) do these works present what we might call harmonic syntactic structures?; and 2) to what extent are those syntactic structures based in tonal procedures?

To address these questions, first we need to consider a question of analytical methods. If Ligeti's triadic successions largely cannot be reckoned against clear, unambiguous to-

[4] Though Patel uses the term "sequences," I will use "successions" to avoid any inadvertent association with non-functional sequential patterns in common-practice harmonic structures.

nal centers, we cannot use traditional methods of tonal analysis, such as Roman numerals, functional analysis, Schenkerian analysis, etc. (Even neo-Riemannian theory, though not tied to a tonal center, is not up to the task of dealing with the more complex harmonic progressions and long-range formal structures of Ligeti's late triadic works.) Instead, we need a means of analysis that can be applied to triadic successions with and without a tonal center that can lead to meaningful comparisons of those successions.

Dmitri Tymoczko (2003) explores such a category of possibilities. Tymoczko compares *root-motion*, *scale-degree*, and *function* theories of tonal-harmonic syntax, pitting rather idealized versions of each category against each other and exploring their relative merits in theorizing the harmonic syntax evident in J. S. Bach's chorales. The first category, root-motion theories, is the one with potential for this project. Tymoczko writes that root-motion theories (like those of Rameau (1722), Schoenberg (1969), Sadai (1980), and Meeus (2000)) "emphasize the relations between successive chords rather than the chords themselves. A pure root-motion theory asserts that syntactic tonal progressions can be characterized *solely* in terms of the type of root motion found between successive harmonies" (p. 3). Thus, a "pure" root-motion theory operates independently of a controlling tonic.

Tymoczko notes a number of limitations to pure root-motion theories. However, all of these limitations involve the failure of a root-motion theory to account for distinctive properties of tonal-harmonic progressions that are scale-degree specific. So while it is worth keeping in mind that in tonal music, a descending-third progression is far more common between I and VI, VI and IV, or IV and II than between VII and V, V and III, or III and I, it is just such distinctive traits of tonal harmony that cannot be compared with non-tonal triadic successions. Such limitations will be the case for any comparison of music that has a tonal center with music that does not. And thus, while that is a notable limitation of this project in

general, it is not prohibitive for the use of a root-motion theory to compare the structures of tonal and non-tonal triadic successions. Rather, the specific benefits and limitations of root-motion theories line up precisely with the limitations and desired comparisons of this project. Thus, for our discussion of harmonic-syntactic structures in Ligeti's triadic music, we will follow Tymoczko's (and thus Meeus's) root-motion paradigm, looking specifically at the harmonic roots present in each movement and the intervals between successive roots.

To explore harmonic structure in Ligeti's triadic works, each movement was analyzed by hand for harmonic content. The style and contrapuntal texture of the six movements in question differ, sometimes significantly. As a result, it is not possible to apply a single automated method to each movement to obtain comparable harmonic progressions. A method ideally suited for the final movement of *Síppal, dobbal, nádihegedűvel*, for example, would return results for *Passacaglia ungherese* that omit salient features of the harmonic structure of the movement to the detriment of a comparative analysis. Thus, I chose different analytical methods for each movement in order to return the most comparable harmonic successions.

In the cases of the two ground-bass movements—*Passacaglia ungherese* and *Hungarian Rock*—chords are analyzed according to the harmonic rhythm of the ground. Only notes outside the ground that are articulated along with the ground are considered part of the chord. Thus, notes tied over from a previous chord and notes articulated apart from any chord in the ground are ignored by the analysis. Essentially, these notes are reduced out of the harmonic texture as quasi-suspensions or as quasi-passing/neighbor tones, respectively. Given the fast decay of the sound of the harpsichord, and the contrapuntal style and regular harmonic rhythm and of these two works, these principles make more musical sense as the broad basis of an automated analysis than simply considering every new vertical pitch(-class) collection.

In the *Passacaglia ungherese*, then, chords are analyzed every half-note (four times per bar) for the duration of the work (figure 2.1). In the case of *Hungarian Rock*, there are five analyzed chords per bar (figure 2.2) until m. 177, where the meter and ground pattern break down. For those last eight measures, the left hand continues to guide the chordal analysis (figure 2.3).

Figure 2.1. Ligeti's *Passacaglia ungherese*, mm. 1–11. Notes articulated on beats marked with arrows are part of harmonic reduction.

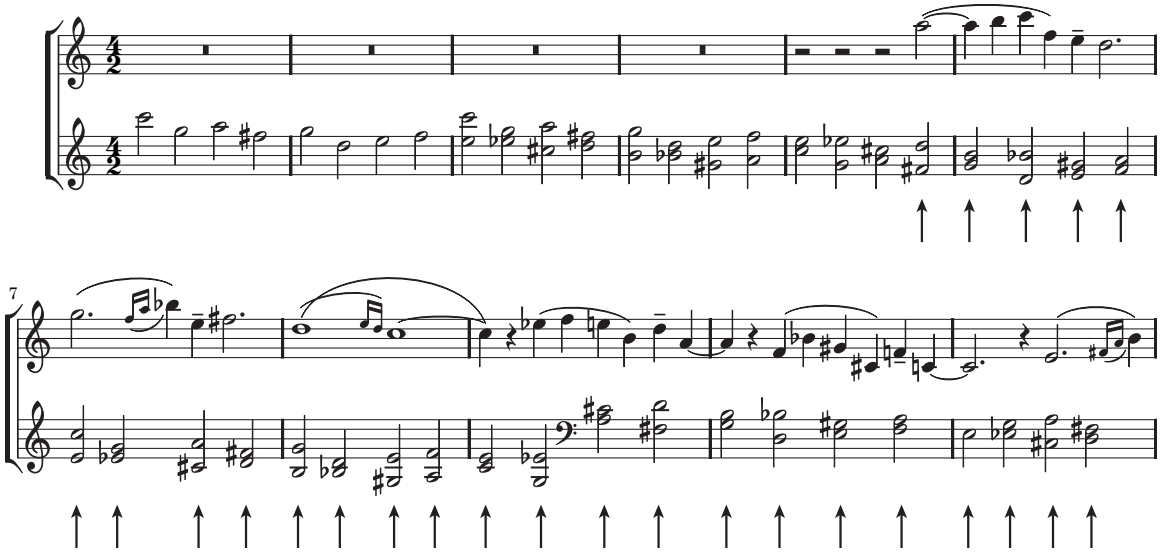


Figure 2.2. Ligeti's *Hungarian Rock*, mm. 1–11. Notes articulated on beats marked with arrows are part of harmonic reduction.

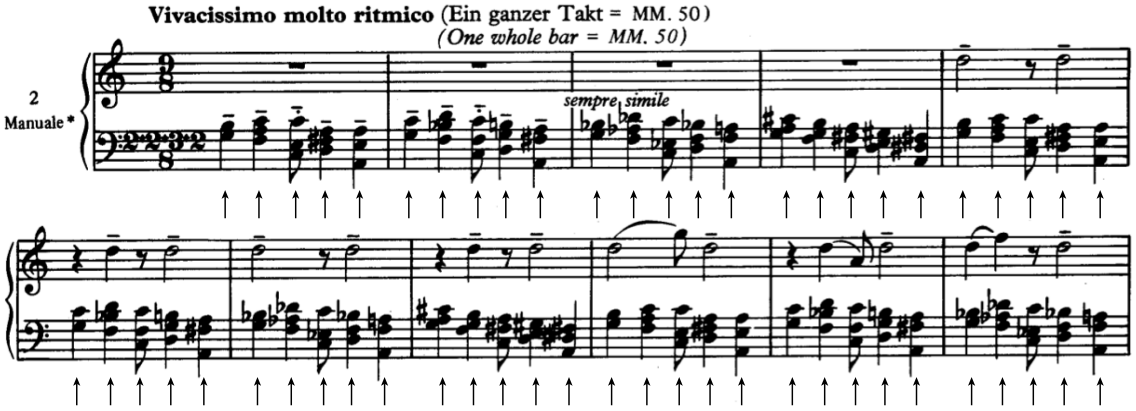
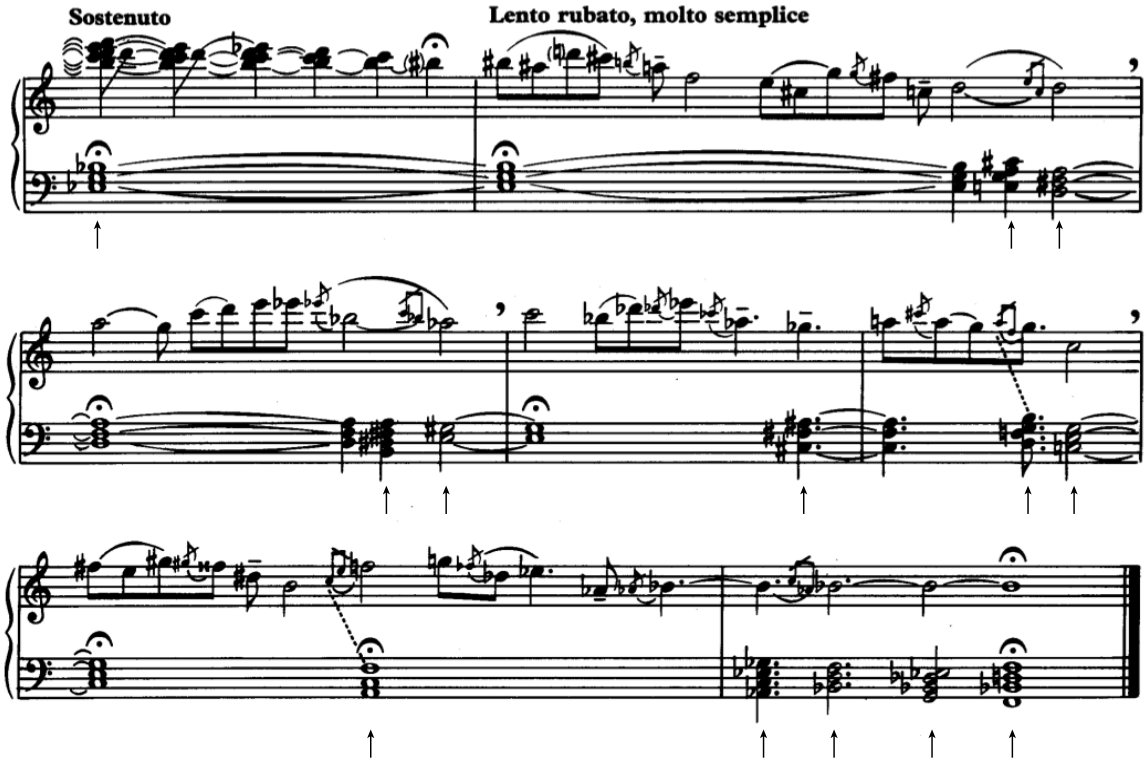
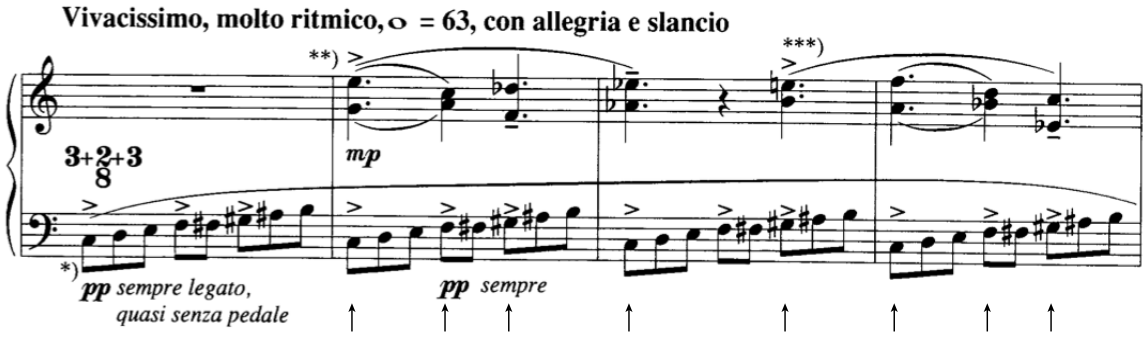


Figure 2.3. End of Ligeti's *Hungarian Rock*. Notes articulated on beats marked with arrows are part of harmonic reduction.



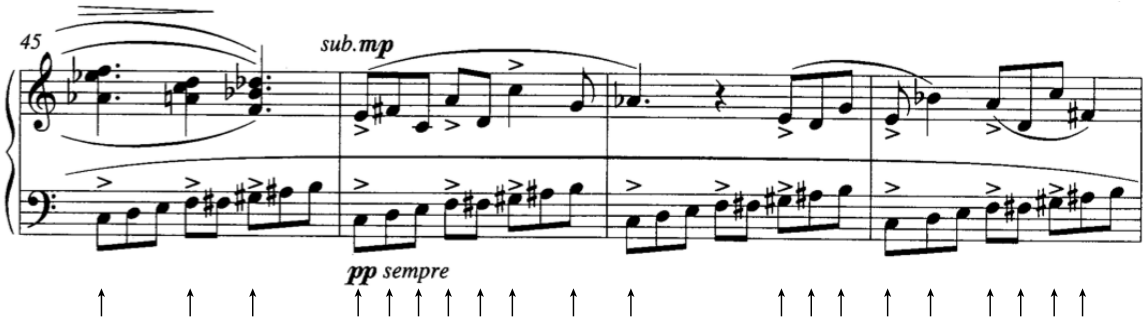
"Fanfares" begins similar in texture to *Hungarian Rock*, with a pattern of dyads in one hand set against a singular line in the other; of course, in "Fanfares," unlike *Hungarian Rock*, the ostinato is the single line of eighth notes, and the variable pattern is the succession of longer-duration chords. The most reasonable analysis in the beginning of the movement, then, looks very similar to *Hungarian Rock*—with a chord reckoned each time a dyad co-articulates with one of the ostinato eighth notes—though it is not based on the same working principle.

Figure 2.4. Ligeti's "Fanfares," mm. 1–4. Notes articulated on beats marked with arrows are part of harmonic reduction.



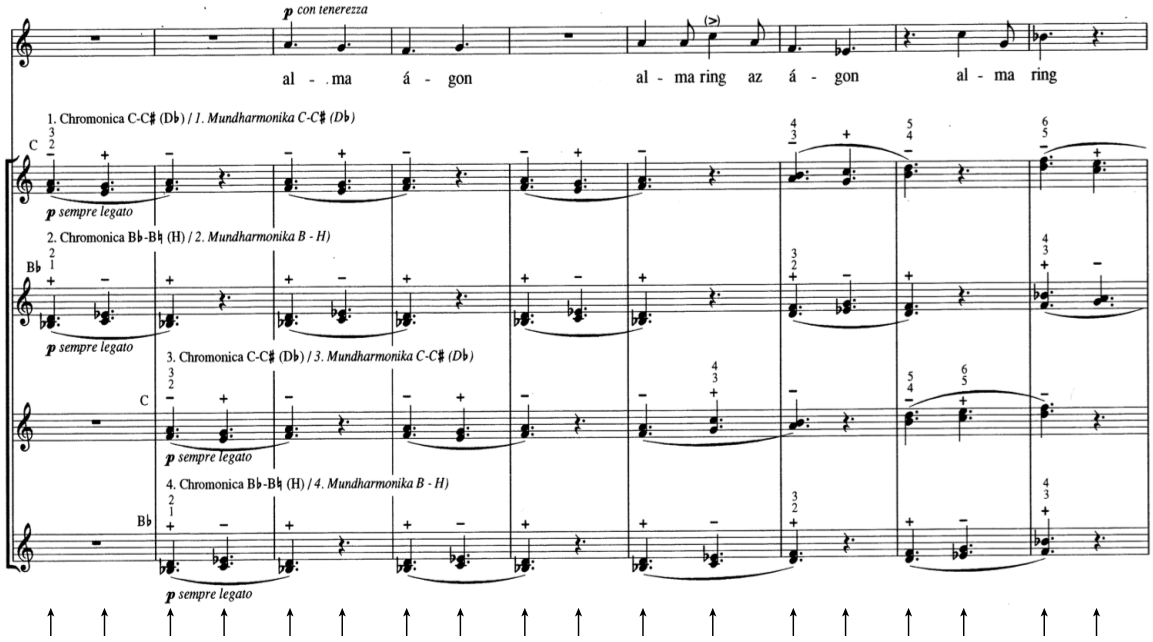
This pattern of quarter-note or dotted-quarter-note dyads does not persist throughout the work (see figure 2.5 below). However, throughout the movement, the non-ostinato voice always moves at the same pace (eighth notes) or more slowly than the ostinato. Thus, in "Fanfares," the rule is: any time the non-ostinato voice changes, analyze and label the chord comprised of all voices articulated at that time. This slightly different rule accomplishes the same result as in the two passacaglias: it returns a succession of dyads and chords (some consonant, some dissonant) with *suspensions* (tied notes) and *neighbor/passing* tones (ostinato eighth notes without an accompanying note/chord in the other hand) reduced out of the texture. The difference is that those notes left out of the "Fanfares" reduction belong to the ostinato voice.

Figure 2.5. Ligeti's "Fanfares," mm. 45–48. Notes articulated on beats marked with arrows are part of harmonic reduction.



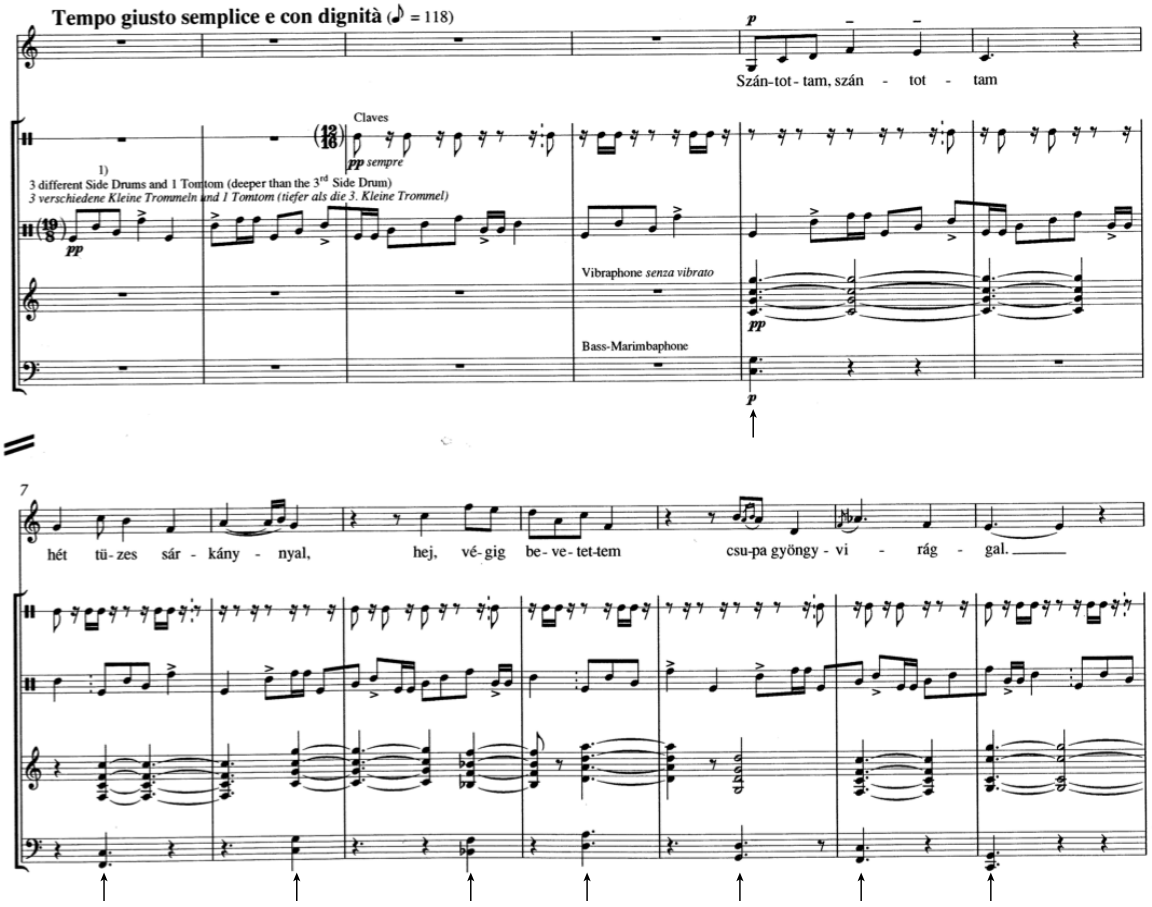
The latter three movements of *Síppal, dobbal, nádihegedűvel* present a different texture, with less of what we might label passing, neighbor, or suspended tones. Movement V, "Alma álma," has a straightforward, regular harmonic rhythm (though that rhythm changes at a few key moments in the form). The vocal melodic line tends to move rhythmically with the blocked chords of the percussion; when the melody moves faster than the percussion, it usually arpeggiates the harmony, with occasional passing or neighbor figures. There is one brief passage where the blocked chords do not move completely in synchrony: mm. 31–35. However, whether we take every new harmonic verticality, or elect to analyze only the chords that follow the rhythmic pattern of one of the individual lines, the harmonic result is the same for the present study. Since we are only considering motions between successive tertian chords, and there is only one pair of successive tertian chords in this passage, the only things that change are the number of zero-interval root progressions and the number of non-tertian chords in succession. Thus, for this movement, the harmonic succession analyzed is that which is generated by the regular harmonic rhythm of the blocked chords in the percussion.

Figure 2.6. Ligeti's *Síppal, dobbal, nádihegedűvel*, movement V, mm. 1–9. Notes articulated on beats marked with arrows are part of harmonic reduction.



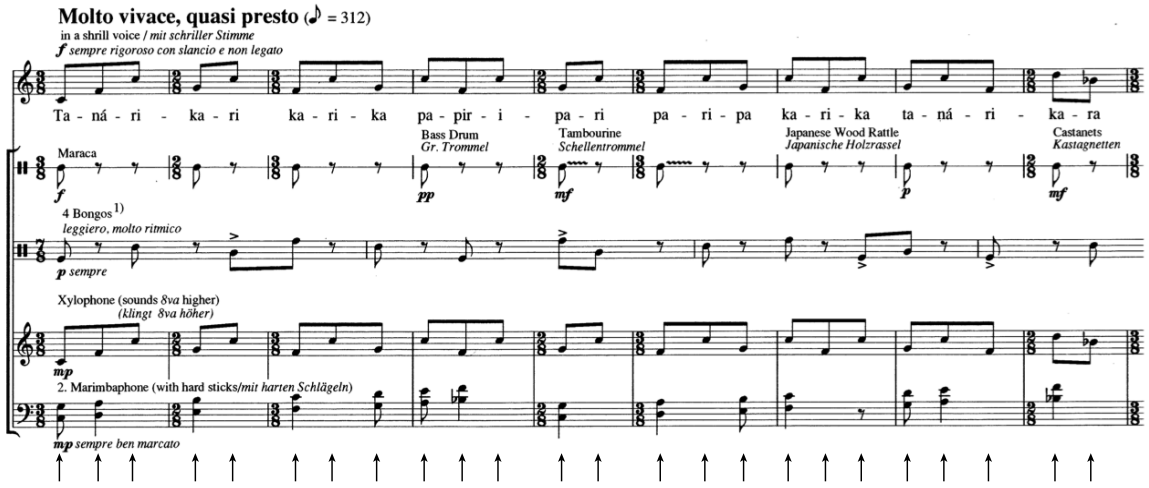
In movement VI, "Keserédes," the melody is more in the manner of a cadenza. Thus, again, each verticality is not considered a new harmony in the succession, but only those that coincide with blocked chords in the percussion.

Figure 2.7. Ligeti's *Síppal, dobbal, nádihegedűvel*, movement VI, mm. 1–13. Notes articulated on beats marked with arrows are part of harmonic reduction.



In movement VII, "Szajkó," on the other hand, there is a new note struck on every eighth note, and most eighth notes see a change in chord root or quality, as well. Thus, every new verticality is taken as a new chord (which is the same as following every note/chord struck by the percussion, as in the analysis of movements V and VI).

Figure 2.8. Ligeti's *Síppal, dobbal, nádihegedűvel*, movement VII, mm. 1–9. Notes articulated on beats marked with arrows are part of harmonic reduction.



Movements VI and VII contain a number of open-fifth chords. While these chords are not triads or seventh chords, I have elected to analyze them as triads missing their thirds. In these open-fifth chords (often with octave doublings), there is no ambiguity as to the "root" of the chord, only its quality. Further, and more importantly, the roots of these fifths participate in the same kinds of root progressions as the complete triads and seventh chords. Thus, for analyzing root and root-progression content, it makes analytical sense to consider both complete tertian chords and these open fifths.

Though the method of harmonic reduction for these movements is not uniform, the results are comparable. That is, each method of segmentation reduces out what look like passing, neighbor, and suspended tones through simple, automated rules, leaving intact a succession of harmonies that coincides with the salient harmonic rhythm of the movement in question.

The successions of harmonies obtained by that analysis were entered into CSV files for each individual movement according to the parameters for Profiler—a set of Perl scripts I designed for the purpose of this analytical project and others like it (see Appendix 1). The

Profiler scripts were used for each movement to obtain a zeroth-order probability profile for the twelve possible chord roots, a succession of root-to-root intervals, and a zeroth-order probability profile for the twelve possible root-to-root intervals in the movement. In the case of chord-root probability, all tertian chord roots were counted (i.e., all integers 0–11). In the case of root-progression successions and probability profiles, only chord-to-chord progressions between two tertian chords *with different roots* were analyzed (i.e., all integers 1–11); all pairs of adjacent harmonies involving at least one dissonant chord, dyad, or single tone were ignored. Spearman (rank) coefficients of correlation (denoted ρ) were calculated for all pairs of like profiles.

NULL HYPOTHESIS

To answer the first research question—do these works contain harmonic syntactic structures?—we need a null hypothesis: what would an asyntactic harmonic succession (one governed by chance) look like? Working within the root-motion paradigm described above, we will begin by looking, very simply, for any zeroth-order patterns (i.e., single chords or chord progressions) in the succession of roots and root intervals that stand out as more common than others. Any root or root interval that occurs noticeably more often than the others would be an indication suggesting preference for that type of progression. If no zeroth-order patterns are privileged, we would expect equal or near-equal numbers of occurrences for all twelve progression types.

The six movements in question exhibit anything but an equal distribution of the twelve pitch-class roots (figure 2.9, below) and eleven pitch-class root intervals (see the left column of figure 2.10). Thus, our first projection of what the null hypothesis might look like in these pieces fails to match the data.

We also might hypothesize that if Ligeti were not thinking syntactically as he composes his harmonic successions, the root-progression distribution would be similar from piece to piece even if none of the distributions is even. Looking at the graphs of figure 2.10, that is also clearly not the case. Each movement has a unique distribution of the eleven root-progression intervals relative to the other works in question. That uniqueness of each work further suggests the possibility of meaningful syntax (i.e., non-chance harmonic sequencing) in these pieces.

However, it is still quite possible that there are parameters unique to each movement that constrain the harmonic possibilities such that each movement cannot but have a unique, non-equal distribution of root progressions, regardless of any compositional agency in the domain of harmonic progression. For instance, *Passacaglia ungherese* is a ground-bass variation movement, whose two-bar ground is a series of eight dyads—all major thirds or minor sixths—that are repeated throughout the piece. This ground substantially limits Ligeti's harmonic possibilities at any given moment of the piece—since only one major triad, one minor triad, and a limited number of seventh chords can be employed with a given dyad—and this substantially limits the potential overall distribution of chord types. As a result, eight roots are privileged significantly over the other four (see figure 2.9), reflective of the eight dyads that make up the ground. And since the sequence of harmonic *progressions* is a direct result of the sequence of *harmonies*, any constraint on the harmonies will comprise a constraint on the progressions, as well.[5]

[5] For instance, a random ordering of chords equally distributed across all twelve pitch-class roots will generate a more-or-less equal distribution of root progressions; a normal distribution of chord roots will generate a more-or-less normal distribution of root progressions (privileging shorter-distance progressions); and an equal distribution of roots among the pitch classes of a single whole-tone collection will generate only even-numbered intervals (equally distributed). Random orderings of other distributions of harmonies will produce other corresponding distributions of root progressions.

How might we rule out the possibility that constraints on harmonic choices are causing the particularities of a movement's root-progression distribution, regardless of any direct compositional agency in the domain of harmonic progression? The simplest way is to compare the actual root-progression distribution with a random ordering of the same set of chords (or, perhaps less prone to error would be comparing them to a random ordering of a large number of chords generated from the same root-distribution proportions). Thus, figure 2.10 contains side-by-side comparisons of the actual root-progression distributions (left) and the root-progression distributions of 10,000 randomly ordered chords of the same root-occurrence probability profile (right). Coefficients of correlation are given below each profile pair. With the sole exception of *Sippal, dobbal, nádihegedűvel*, movement V, there is little to no correlation between the root-progression profiles of the actual and randomized harmonic successions. That is, perhaps, the strongest evidence in these works for meaningful harmonic syntax, and thus for compositional agency in the domain of harmonic progression.

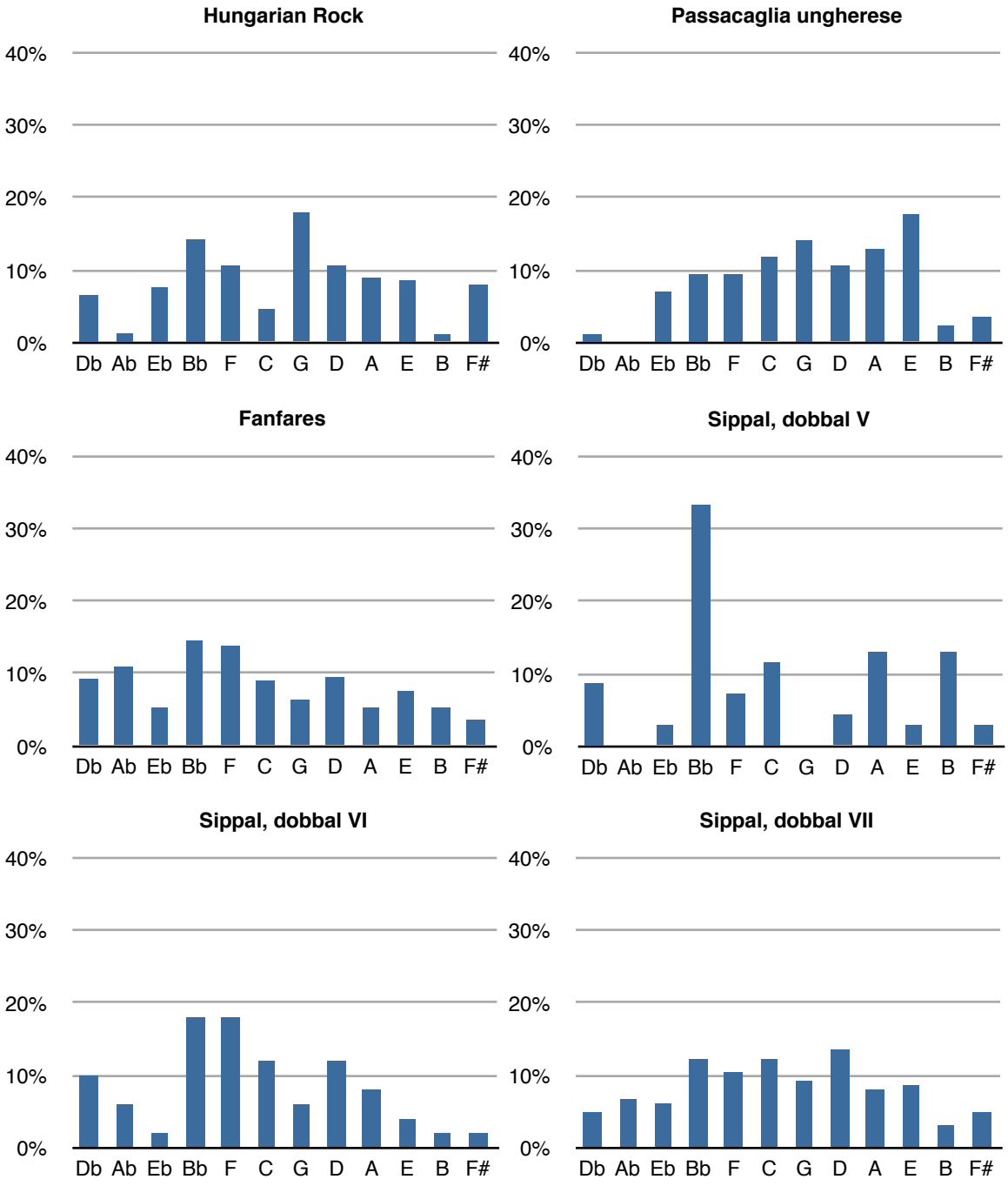
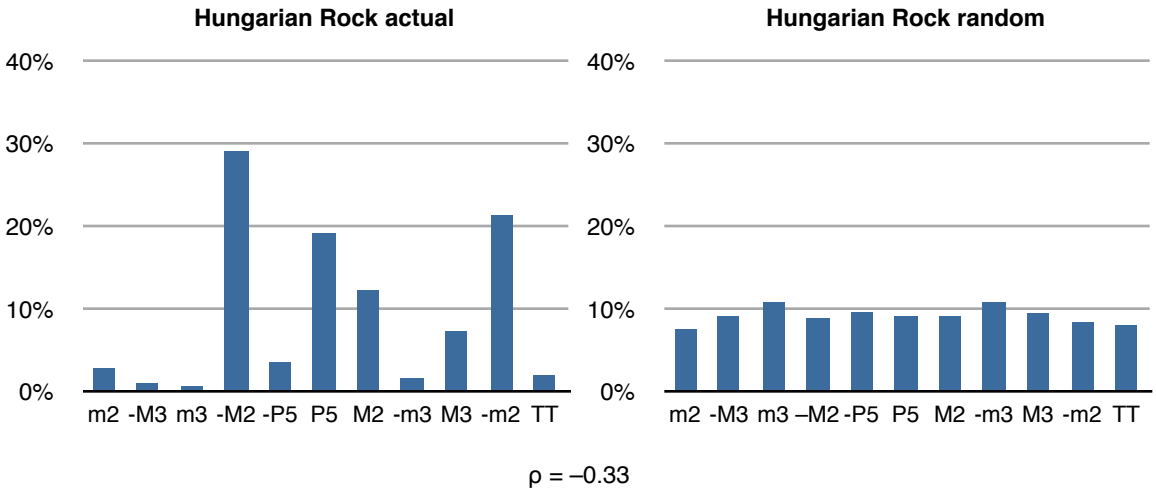
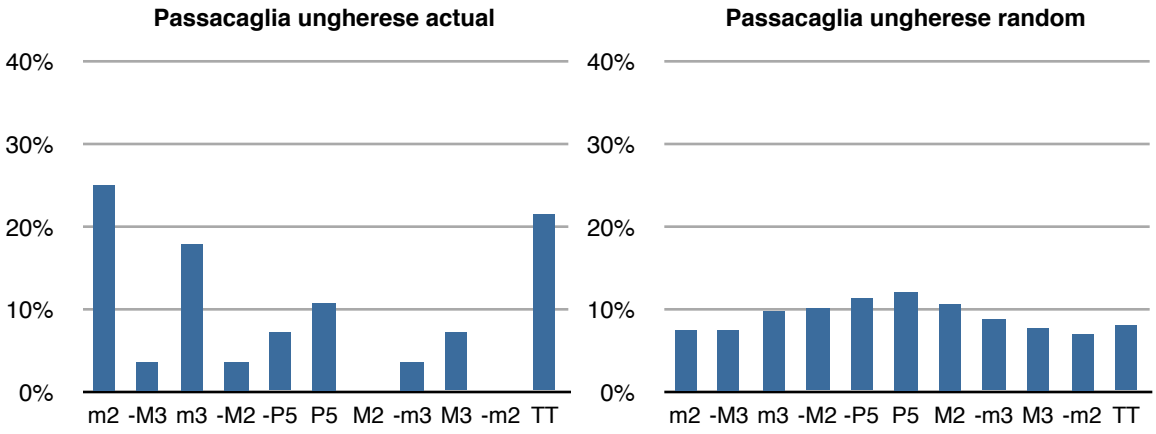


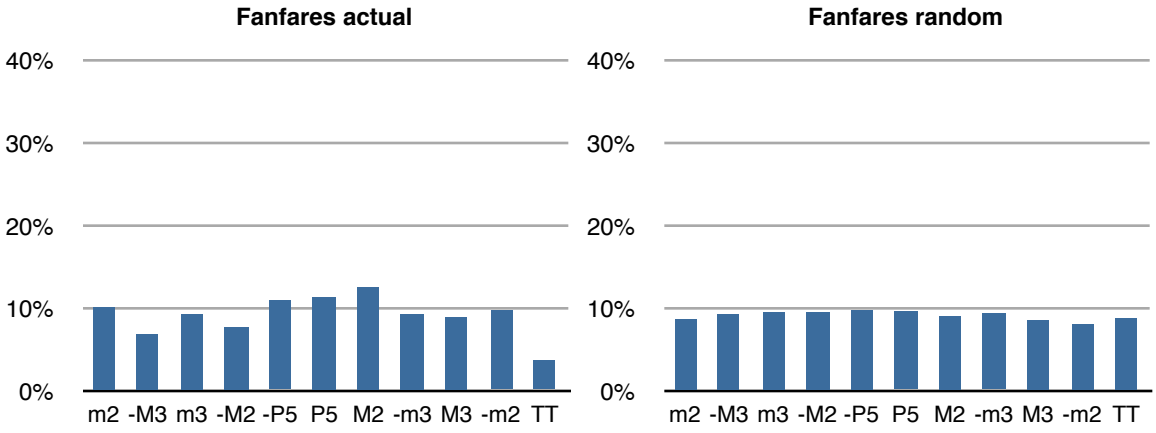
Figure 2.9. Probability profiles for chord-root distribution in Ligeti's triadic movements, arranged according to the circle of fifths.



ρ = –0.33



ρ = –0.10



ρ = 0.10

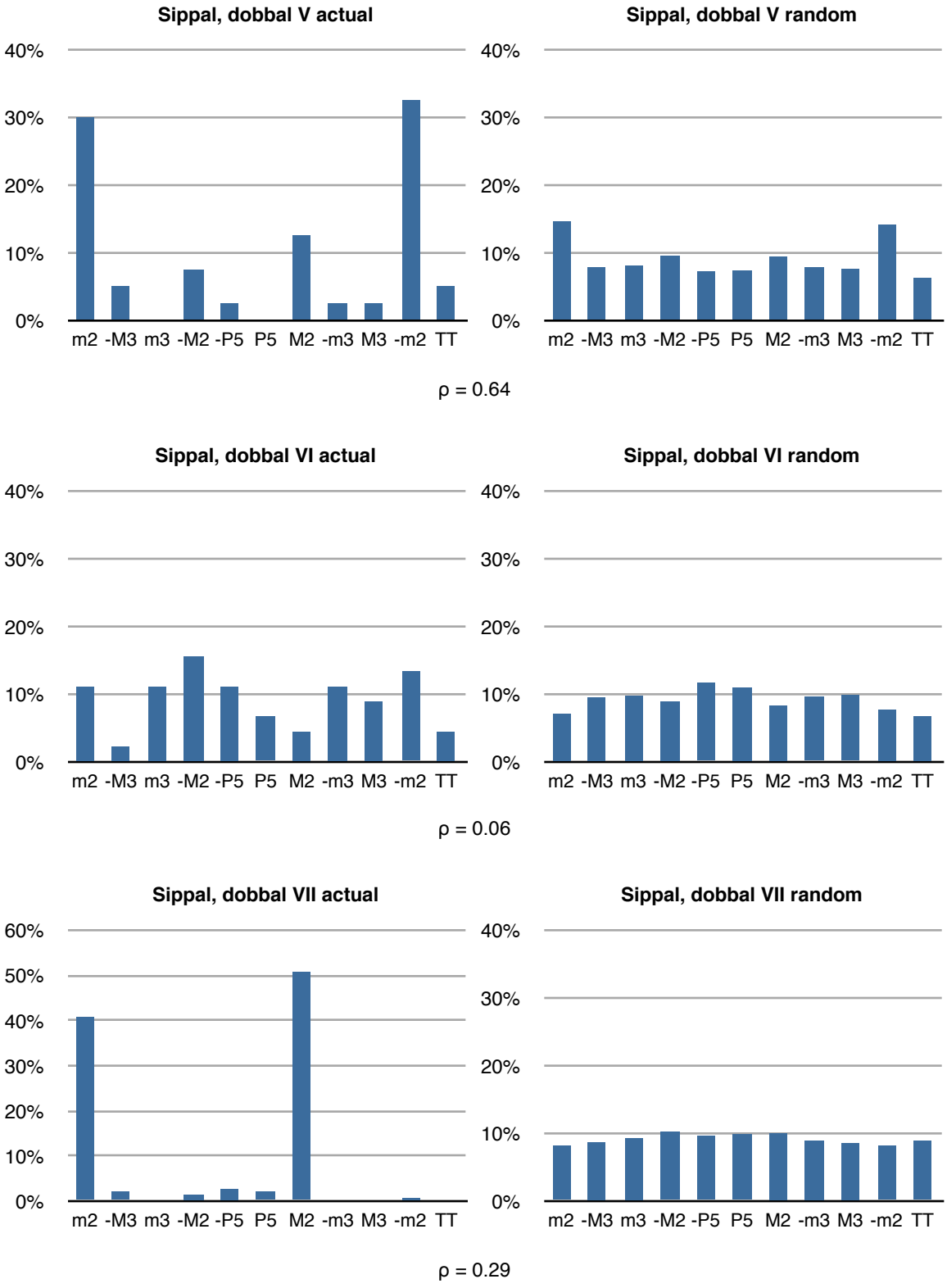


Figure 2.10. Probability profiles for root-progression distributions (left) and root-progression distributions of 10,000 randomly ordered chords of the same root-occurrence probability profile (right). Root intervals are arranged on the circle of fifths. Coefficients of correlation (Spearman rank correlation) are given below each profile pair.

Seeing that Ligeti's triadic works generally possess unequal, unique root-progression distributions that correlate weakly (at best) with a random ordering of the same distribution of harmonies, we have fairly strong evidence of direct compositional agency in the domain of harmonic progression. There are more complicated parameters within which a chance procedure may produce unequal, unique root-progression distributions, and we will explore that possibility in Chapters 3–5 as appropriate as we consider each movement individually. However, for the time being, we can safely presume a strong possibility that these movements possess meaningful harmonic syntax. With this caveat in mind, we can proceed to the second, and more substantial, of the key questions of this chapter: to what extent are the syntactic properties of these works based in tonal procedures?

TONAL SYNTAX

We will now look at the tonal structures to which we will compare Ligeti's triadic successions. In what follows, I perform a root-motion analysis on two corpora representative of tonal musics (J.S. Bach's four-part chorales and a corpus of rock songs). Comparing these analyses with the data from Ligeti's triadic pieces allows us to understand better the meaningfulness of Ligeti's harmonic successions, as well as the extent to which the syntactic structures of Ligeti's triadic music is related to syntactic structures in tonal musics.

TONAL CORPUS ONE: THE BACH CHORALES

Data on the harmonic successions of J. S. Bach's chorales is taken from Ian Quinn's (2010) analysis of the Riemenschneider edition of Bach's chorales. Quinn's method takes every new verticality as a chord in the harmonic succession—"every time a new note sounds, a new chord is identified" (p. 3)—and does not distinguish between chord tones and non-chord tones. Each chord is analyzed as a bass pitch-class and a set of intervals (in semitones, modulo the octave) above the bass. Each progression between adjacent chords is analyzed as an interval between bass notes and the categories of the first and second chords. Though Quinn's method does not label chords according to their roots, nor chord progressions according to their root progressions, it is simple to convert Quinn's chord-progression categories to root progressions and, thus, to root and root-progression probability profiles for direct comparison with Ligeti's triadic pieces. Following are the results of that conversion. As in the Ligeti movements analyzed by Profiler, chord-root probability profiles take all tertian chords into account, and root-progression probability profiles take only tertian-chord-to-tertian-chord progressions into account.

The complete Riemanscheider corpus of J.S. Bach's chorales generates the following chord-root distribution profile:

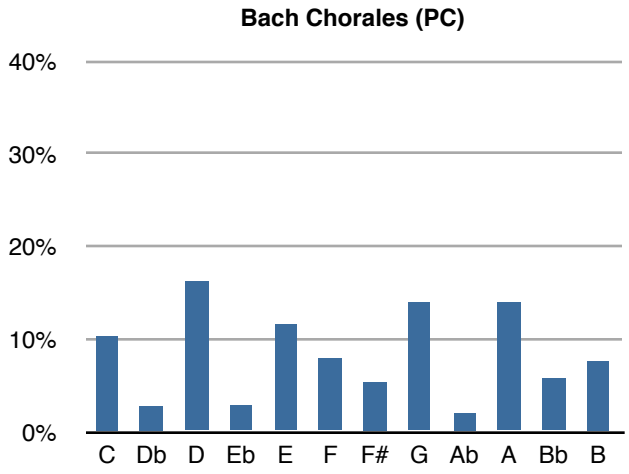


Figure 2.11. Chord-root (pitch-class) distribution profile for J.S. Bach's four-part chorales.

Setting that profile on the circle of semitones (as above) masks perhaps the most prominent feature of its structure. Following is the same profile represented on the circle of fifths:

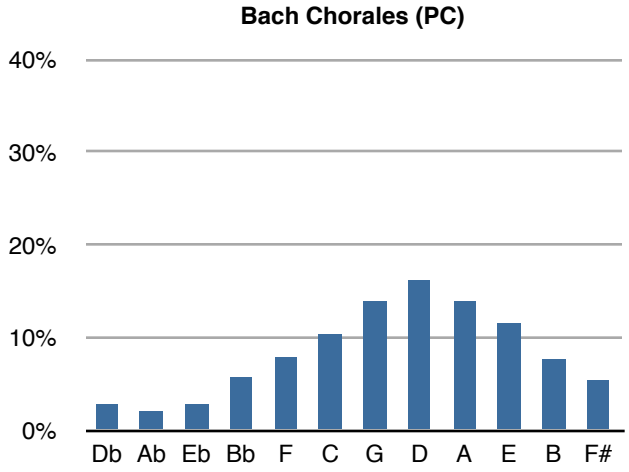


Figure 2.12. Chord-root (pitch-class) distribution profile for J.S. Bach's four-part chorales, arranged according to the circle of fifths.

We can see very clearly from the circle-of-fifths representation that the roots of the chords used in Bach's chorales as a corpus present a nearly perfect bell curve, peaked on D.[6] The shape of this profile is remarkable, but it is not wholly unexpected. The seven pitch-classes of the diatonic scale occupy seven adjacent positions on the circle of fifths; tonal-diatonic music prefers in-key pitches to out-of-key pitches; and tonal-diatonic music (both for historical and practical reasons) utilizes keys with few or no flats or sharps more than keys with many flats or sharps. As a result, we would expect the region of the circle of fifths whose chords belong to the diatonic collections of what we might call the "white-key" tonalities to be more common in a tonal repertoire than the region of the circle of fifths whose chords belong to the diatonic collections of what we might call the "black-key" tonalities. In other words, we might expect that the Bach chorales have more chords built on G, D, and A than F-sharp, C-sharp, and G-sharp. Nonetheless, the near perfection of the bell curve is striking.

Of course, the profiles of figures 2.11 and 2.12 may seem somewhat artificial within the context of a tonal repertoire. After all, these are aggregate totals of the harmonic content of a number of pieces in different keys. Are they masking more intrinsic properties of the harmonic successions that take place in the context of a key? The following figure shows that what happens on the absolute-pitch level generally also happens on the scale-degree level, though the features are more pronounced in scale-degree space than in the aggregate values of absolute-pitch space. (It should be noted that, for the purposes of automation with minimal human interpretive interference or worry about dual-functioning chords, each chord in the following profiles is reckoned against the concluding key of the entire chorale—i.e., the home key of the chorale—rather than the local tonic in modulating contexts.)

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[6] Of course, since this profile is *not* a random (noisy) distribution of values clustered around a mean value, it is not in actuality a normal, or Gaussian, distribution.

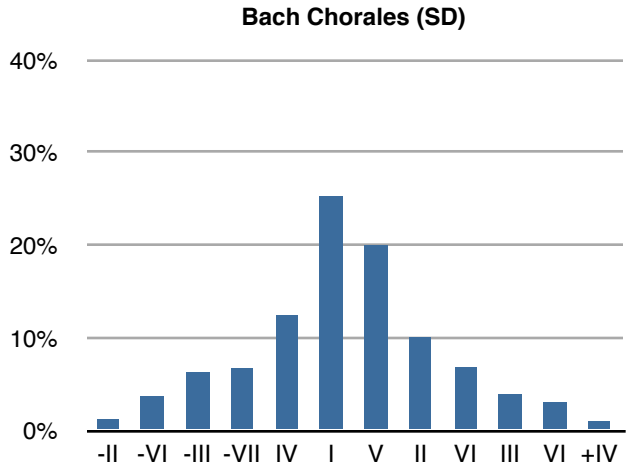


Figure 2.13. Chord-root (scale-degree) distribution profile for J.S. Bach's four-part chorales, arranged according to the circle of fifths.

This figure demonstrates that the bell-curve shape (i.e., the preference for a cluster of closely related harmonic roots on the circle of fifths) is largely preserved, but the differentiation is more pronounced in the scale-degree contexts (i.e., the slope of the curve is steeper). In fact, the Spearman rank-correlation coefficient between the scale-degree root-distribution profile and the absolute-pitch root-distribution profile (transposed down 2 semitones to line up the peaks) is 0.99. Thus, whether operating in scale-degree or absolute-pitch space, these properties of the harmonic structure of Bach's chorales are nearly identical.

These properties of the harmonic structure are similar, but the fact that such a smooth curve occurs in the scale-degree domain as well as the absolute-pitch domain prompts a modification of interpretation. I suggested above that the bell-curve-like distribution of absolute-pitch roots in the Bach chorales could in large part be a result of a preference for in-key chords over out-of-key chords, combined with a preference for white-key tonalities over black-key tonalities. This would explain, generally, the high probabilities of occurrence for the chords at the peak of the absolute-pitch distribution and the low probabilities of occurrence for the chords at the trough of the absolute-pitch distribution. However, within keys, all such a hypothesis contains is a preference for in-key chords over out-

of-key chords, not a preference for tonic over other primary triads (IV and V), and for primary triads over secondary triads (II, III, VI, and VII). Such a hierarchy of harmonic preference is more likely based in the relationships of the various in-key harmonies to the controlling tonic. Numerous speculative writings have suggested a "tonal hierarchy" with the tonic chord at the top, followed by the dominant and subdominant chords, with the secondary chords at the bottom, and numerous other statistical analyses of tonal music and experimental studies in music cognition have provided data in support of such a tonal hierarchy, as well as a causal relationship between the statistical properties of tonal music and the internal expectancies and stability perceptions of listeners familiar with tonal music (c.f., Meyer 1956; Bharucha and Stoekig 1986; Krumhansl 1990; Cross, West, and Howell 1991; Tillmann, et al., 2003 & 2008; Huron 2006; among many others). It is quite possible that the shape of the distribution of root occurrences on the circle of fifths is a manifestation of this hierarchy, with its peak at tonic, followed by dominant and subdominant, then the remaining in-key chords, and finally out-of-key chords.

Of course, what is of greatest interest for this project is the root-*progression* profile, which follows in figure 2.14, alongside that of a random succession of chords generated by the scale-degree-based root distribution profile.

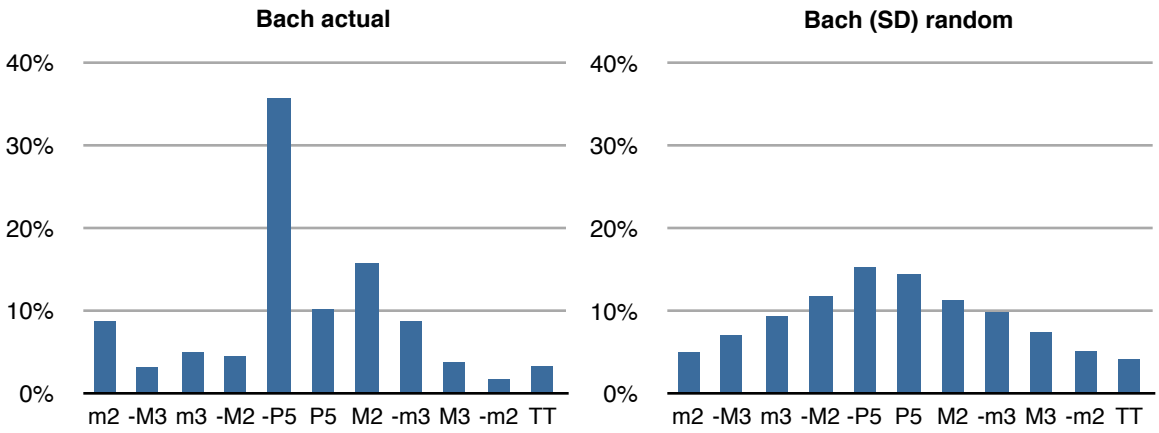


Figure 2.14. Root-progression profile for the actual successions of chords found in J.S. Bach's four-part chorales (left) and root-progression profile for a random ordering of chords with the same zeroth-order probability profile as the scale-degree chord-root distribution profile for J.S. Bach's four-part chorales (right). Root intervals are arranged on the circle of fifths.

There is a moderately high degree of correlation between this profile and the random-succession profile based on scale-degree probabilities (ρ = 0.69). However, this actual root-progression profile has a noticeably different shape than the profile generated from a random succession of chords based on the (scale-degree) chord-root probability profile.

We can see very clearly in figure 2.14 the specific deviations from the random-succession profile. First, there is a difference in the rank-ordering of root-progression intervals. Relative to the rank ordering of the random-succession profile, several values stand out: 1 (too low), 6 (too high), 7 (too high), and 11 (too high).

Second, there is a difference in the degree of symmetry between the actual and random successions of harmonies. That is, if the actual harmonic successions resembled the random succession, 1 and 11 would be nearly equal, 2 and 10, and so on. But the actual profile demonstrates a noticeable asymmetry at several points.

Table 2.1. Comparison of zeroth-order probabilities of ascending and descending root-intervals in J. S. Bach's four-part chorales.

Root progression	Ascending	Descending	Difference
P5	10.10%	35.70%	25.60%
M2	15.71%	4.50%	-11.21%
m3	4.89%	8.68%	3.79%
M3	3.67%	3.14%	-0.53%
m2	8.68%	1.65%	-7.03%
TT		3.28%	—

This directional asymmetry of root intervals is noted by Meeus (2000), and recounted by Tymoczko (2003) and Quinn (2010). In fact, Meeus takes this to be a definitive property of tonal music, in contrast to pre-tonal triadic music. We will return to that consideration later. For now, let us note the specific points of variance between the actual and random root-interval distributions. First, there is a large difference between 1 and 11, in contrast to the nearly equal values in the random profiles. Specifically, descending fifths outnumber ascending fifths by more than triple. The opposite is true for major seconds: ascending major seconds outnumber descending seconds by more than triple. A smaller, but noticeable, effect is seen for ascending and descending minor thirds: descending minor thirds outnumber ascending minor thirds by almost double. And finally, ascending semitones are over five times more common than descending semitones. In what follows, we will consider the potential significance of these various non-random properties of the root progressions of Bach's chorales.

First, consider the ascending semitone progression, which stands out both in terms of rank (its probability is greater than those of both tritone and ascending-major-third progressions, rather than possessing the median of those three probabilities) and in terms of asymmetry (its probability is far greater than that of a descending semitone, its directional inverse). This standout value is largely due to a single kind of chord motion in the Bach cor-

pus: a diminished triad or fully diminished seventh chord whose root ascends by semitone to the following chord root accounts for 72% of the ascending-semitone root progressions. In other words, this is a VII–I motion (or applied VII–I motion). (See Appendix 2 for a table containing the tallies for harmonic progressions in the Bach chorales where both root progression and chord quality are distinguishing factors.) While on the circle of fifths this is a distant root motion, it is actually akin to a close root motion. This is because there are a number of stock progressions in which VII and V^7 are interchangeable—VII can function like (indeed, it is) an incomplete (applied) V^7 chord. With that relationship in mind, the ascending-semitone progressions that make this value unexpectedly high are functionally equivalent to a descending fifth. Thus, we can reinterpret these diminished chords as incomplete dominant-seventh chords—ascending-semitone progressions as descending-fifth progressions—and the value for ascending semitones ceases to differ significantly from its corollary in the random distributions (though the value for descending fifths increases its deviation). Instead of ascending-semitone progressions accounting for 8.68% of the root progressions, the value is reduced to 2.41%; the descending-fifth progression value raises from to 35.70% to 41.96%.

Next, let us consider the tritone progressions. These are progressions that almost always land on a diminished triad or half-diminished seventh chord. (Again, see Appendix 2.) They also tend to initiate on major triads (or major- or dominant-seventh chords). Before examining the specific scale degrees involved, we can make some educated guesses regarding the proliferation of this particular type of chord progression. In the tonal system, there are two places where we would expect a diminished triad (or a half-diminished seventh chord): on the leading tone (in major-key, minor-key, or applied-VII situations), or in minor keys on the supertonic. In both cases, the pitch class that is a tritone away from the potential arrival

chord is a *diatonic* fifth above (IV above VII in major and minor, VI above II in natural or harmonic minor). And in all cases except for IV in minor, when that pitch class is the root of a chord, it is the root of a major chord (or a major- or dominant-seventh). So it seems, then, that these tritone progressions are likely to function like descending-fifth progressions that happen to occur at the point that the diatonic scale's maximally even cycle of fifths hits its anomalous diminished fifth. In other words, these progressions that appear as tritones in *chromatic*-pitch-class space are likely functioning as simple fifth descents in *diatonic*-pitch-class space.

When we look at the scale degrees involved in these progressions, we do, indeed, find that most of these tritone root progressions begin on scale-degrees 4 (IV in major and minor—38%) and lowered-6 (VI in minor—22%), confirming that these tritone root progressions are *diatonic* fifth descents that occur across the anomalous diminished fifth in the diatonic scale. Thus, this analysis allows us to reinterpret these tritone progressions as syntactically analogous to descending-fifth progressions, bringing the value in our profile for tritone progressions down from 3.28% to 1.56%, more in line with the random-succession profiles; but, again, that also causes us to raise the descending-fifth value to a point even further out-of-line with the random profiles, from 41.96% to 43.68%.

The altered profile resulting from the preceding analysis (see figure 2.15 and table 2.2) leaves us with two values that stand out relative to the random successions: 1 (too low) and 11 (too high). It also leaves us with three root intervals that are directionally asymmetrical: 1 and 11 (favoring 11), 2 and 10 (favoring 2), and 3 and 9 (favoring 9). We could further simplify our analysis and simply say that tonal-harmonic progressions, as exemplified by the Bach chorales, exhibit directional asymmetry among closely related motions on the circle of fifths, and that that asymmetry is so striking that it affects the relative ranking of adjacent prob-

abilities, as well. Thus, the ranking discrepancies relative to a random succession are likely a result of the property of directional asymmetry.

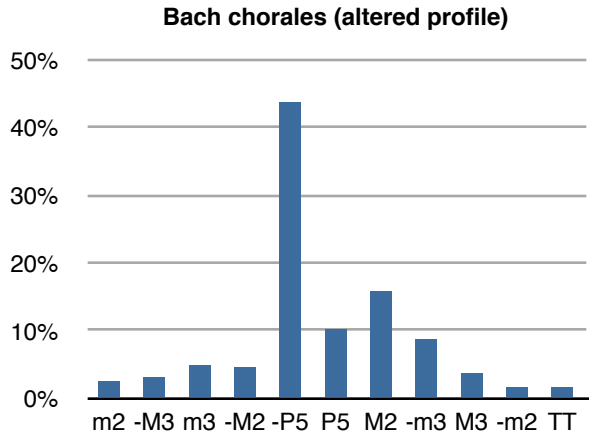


Figure 2.15. Root-progression profile for the actual successions of chords found in J.S. Bach's four-part chorales, arranged according to distance on the circle of fifths. Values are altered to reflect chord substitutions described above.

Table 2.2. Comparison of zeroth-order probabilities of ascending and descending root-intervals in J. S. Bach's four-part chorales. Values are altered to reflect chord substitutions described above.

Root progression	Ascending	Descending	Difference
P5	10.10%	43.68%	33.58%
M2	15.71%	4.50%	-11.21%
m3	4.89%	8.68%	3.79%
M3	3.67%	3.14%	-0.53%
m2	2.41%	1.65%	-0.76%
TT		1.56%	—

While speculating on the reasons behind these particular directional asymmetries would be tangential to the question at hand in this project, it is interesting to note that the directional asymmetry of tonal-harmonic progressions is relegated to the closest root-motions on the circle of fifths, which are also the most common root-motions in the Bach corpus: perfect fifths, major seconds, and minor thirds (1, 2, and 3 fifths, respectively). Assuming we consider the (applied) diminished VII–I motions to be incomplete V^7–I motions, directional asymmetry does not extend to major-third and semitone root motions (4 and 5 fifths, respectively). (While Meeus, Tymoczko, and Quinn find asymmetry in diatonic third

progressions, generally, the present data—derived from the same corpus—suggests that this is a phenomenon of minor-third root motions and not major-third root motions. And interestingly, Tymoczko finds that this directional asymmetry "increases as one moves down the cycle of thirds from I to V. . . . It is therefore an oversimplification to suggest that tonal harmony *in general* is biased toward 'dominant' progressions [i.e., descending fifths, descending thirds, and ascending seconds, after Meeus]. Rather, the bias belongs to a limited set of chords within the diatonic universe" (p. 16).)

We can thus summarize the chord-to-chord properties of tonal-harmonic syntax as exhibited by the Bach chorales: *In common-practice tonal-harmonic music, closely related root progressions are more common than distantly related root progressions, as measured on the circle of fifths. Further, the closest circle-of-fifths root motions exhibit directional asymmetry: an over-privileging of descending-fifth, ascending-major-second, and descending-minor-third progressions at the expense of their directional inverses.* Other unexpectedly high values in the Bach chord-progression profile—relative to a random succession of the same distribution of harmonic roots—can be interpreted as progressions that substitute for the more typical fifth-descent progressions.

TONAL CORPUS TWO: ROCK MUSIC

Though the Bach chorales are a common stand-in for tonal music in general when considering harmonic structures, and though the Bach chorales are often the paradigmatic model of tonal harmony for undergraduate students of music theory, they form a particular subset within the broader repertoire of tonal harmony. Thus, it is worth looking at tonal music outside the Bach chorales to explore whether these two distinctives are operative in tonal music generally speaking, or whether they are idiosyncratic to J.S. Bach (or even more specifically, to his choral music or his four-part chorales). Further, both the title of Ligeti's *Hungarian Rock* and the claims of scholars like Toop (1999) and Easwaren (2000) that Ligeti's students' interest in popular music motivated the composition of his two 1978 harpsichord pieces suggest that a comparison of Ligeti's harmonic practices with the syntactic properties of pop/rock music may bear fruit. Trevor de Clercq and David Temperley's (2011) article, "A corpus analysis of rock harmony," and follow-up work published on their website, provides an excellent baseline for such a comparison.

De Clercq and Temperley formed a 100-song corpus (called the "RS 5 x 20 corpus") from "*Rolling Stone* magazine's list of the '500 Greatest Songs of All Time,'" using "the 20 top-ranked songs from each decade (the 1950s through the 1990s)" (p. 47). The two authors analyzed the harmonic progressions of each of these songs independently, compared results (for correction and for comment on their different interpretations of ambiguous passages), and performed a statistical analysis of these analyses. That analysis generated zeroth-order root-occurrence probability profiles (scale-degree based), zeroth-order root-interval probability profiles, and first-order chord-root transition probability tables (scale-degree based). The former two are entirely analogous to the scale-degree root-occurrence profiles and root-

interval profiles already discussed in this dissertation for the Bach corpus and for Ligeti's late triadic pieces.

Comparing de Clercq and Temperley's 5 x 20 corpus to the Bach-chorale corpus yields some interesting findings. First, an examination of the chord-root distribution on the circle of fifths (each tertian chord reckoned according to the scale degree of its root in its tonal context) yields certain key similarities and differences between the two tonal repertoires.

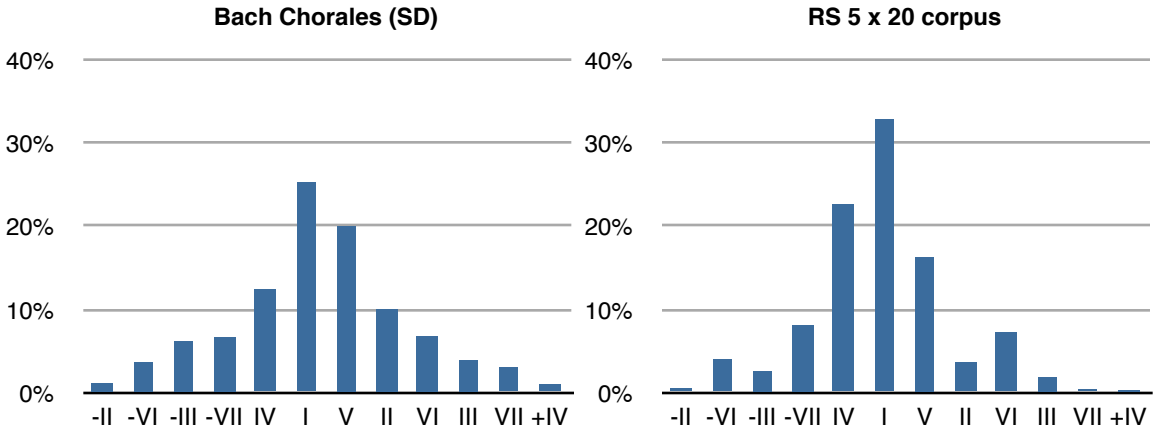


Figure 2.16. Chord-root distribution profiles for J.S. Bach's four-part chorales and de Clercq & Temperley's 5 x 20 corpus, arranged according to the circle of fifths.

Table 2.3. Side-by-side probabilities for each scale degree in the Bach chorales and the rock corpus.

Scale Degree	Bach	Rock	Difference
+I/-II	1.15%	0.50%	-0.65%
-VI	3.69%	4.00%	0.31%
-III	6.21%	2.60%	-3.61%
-VII	6.68%	8.10%	1.42%
IV	12.40%	22.60%	10.20%
I	25.19%	32.80%	7.61%
V	20.00%	16.30%	-3.70%
II	10.02%	3.60%	-6.42%
VI	6.77%	7.20%	0.43%
III	3.90%	1.90%	-2.00%
VII	3.02%	0.40%	-2.62%
+IV/-V	0.96%	0.30%	-0.66%

These two profiles correlate highly (ρ = 0.93), and both privilege in-key chords over out-of-key chords (though that property is more pronounced in the rock corpus).

Of course, the most significant point of contact between these two genres for the purposes of the current project is not the chord-root probability profiles of these two genres, but the root-progression probability profiles.

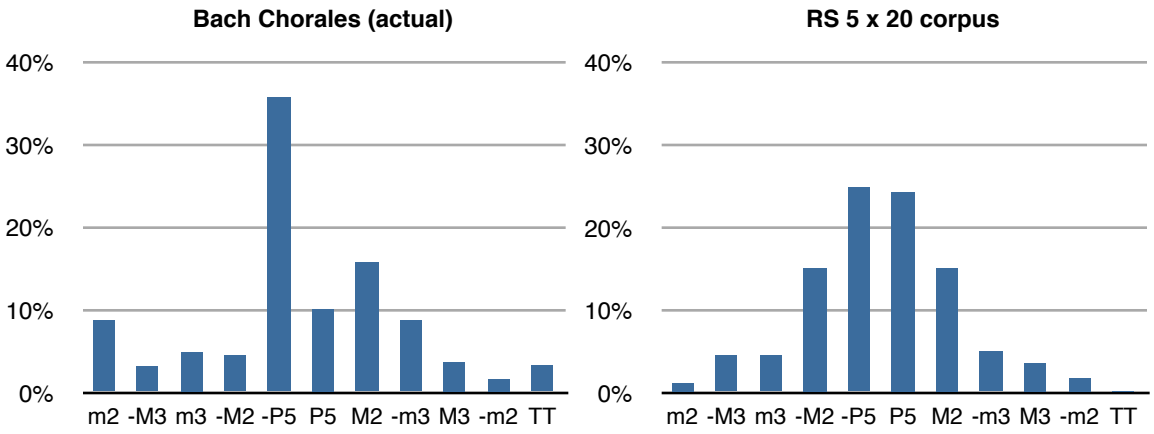


Figure 2.17. Root-progression profiles for the actual successions of chords found in J.S. Bach's four-part chorales and the 5 x 20 corpus, arranged according to distance on the circle of fifths.

First, there is a moderate degree of correlation between these two profiles: ρ = 0.58. However, taking into account the chord substitutions in the Bach chorales discussed above, the altered Bach profile correlates highly with the rock profile: ρ = 0.84. Generally speaking, then, the harmonic-syntactic structures of these two corpora possess a significant degree of similarity. That similarity comes, in terms of the two definitive tonic-agnostic markers of tonal syntax, in a shared preference for close root motions on the circle of fifths. However, the second marker of tonal syntax found in the Bach chorales is altogether missing from the 5 x 20 corpus: directional asymmetry.

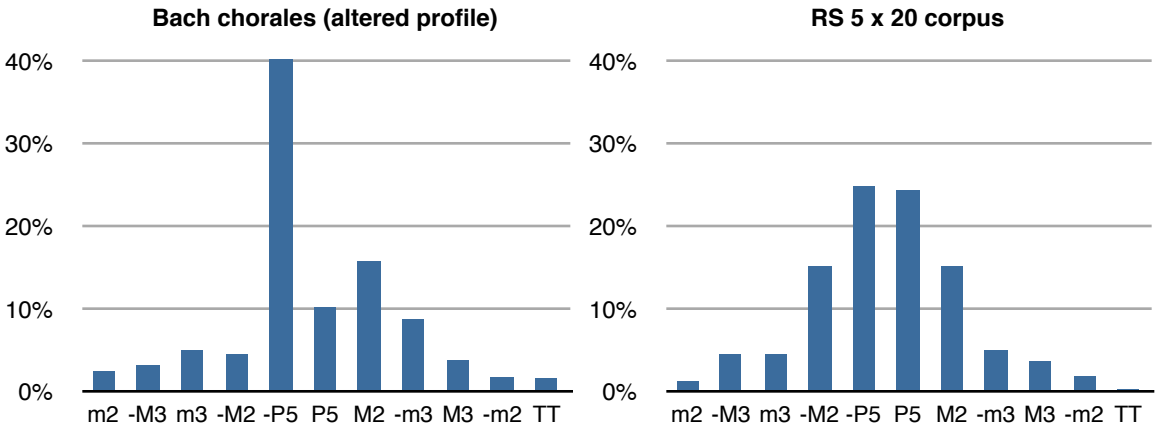


Figure 2.18. Root-progression profiles for the actual successions of chords found in J.S. Bach's four-part chorales (with chord substitutions) and the 5 x 20 corpus, arranged according to distance on the circle of fifths.

Since writing their article, however, de Clercq and Temperley have extended their corpus, performing the same analysis, incorporating the same methods, on additional songs from the *Rolling Stones* list. The results of their analysis of the extended 200-song corpus can be found on their website (see bibliography for URL). Figure 2.19 places the root-interval probability profiles for the 100-song and 200-song corpora side-by-side. (Keep in mind that because the 200-song corpus includes the 100-song corpus, any difference between the two should be doubled to obtain the difference between the first 100-song set and the second 100-song set.)

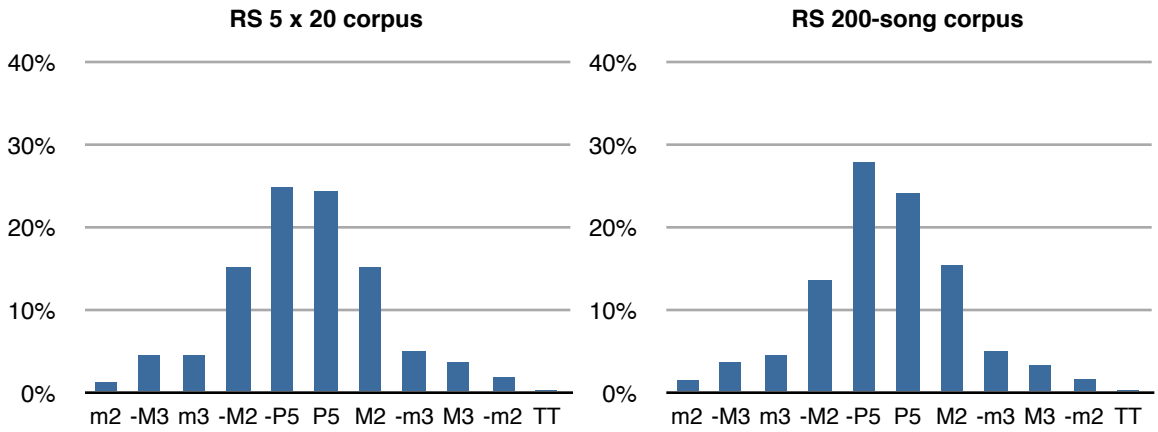


Figure 2.19. Root-progression profiles for the 5 x 20 corpus and de Clercq & Temperley's extended 200-song corpus, arranged according to distance on the circle of fifths.

The difference is subtle, but it is clear that the extended corpus *does* possess directional asymmetry for the closest root motions on the circle of fifths (perfect fifths and major seconds), though it is smaller than that exhibited by the Bach chorales. (The Spearman coefficient of correlation between the 200-song rock corpus and the Bach corpus is rather high, at 0.90.)

In a series of email and in-person conversations, I discussed this difference between the song sets (and the differences between the original 5 x 20 corpus analysis and a corpus analysis performed by David Huron, the data behind which is only partially available) with de Clercq and Temperley. In the context of that discussion, de Clercq suggested the possibility of blues-based rock songs in their original corpus diminishing the directional asymmetry of the averaged results: a standard 12-bar blues progression is directionally asymmetrical, but favors the opposite direction of the Bach chorales and non-blues rock songs for fifth and major-second progressions (email message to author, March 30, 2011). That analysis suggests that the symmetrical profile of the 5 x 20 rock corpus is the result of averaging two different and opposed *asymmetrical* profiles (blues and non-blues rock). Further research in light of these discrepancies and potential explanations will likely bear fruit on the questions of defining *rock* as a genre, delineating a rock corpus (both questions addressed in de Clercq and Temperley's article), and statistical methods used in musical corpus analysis. However, for the purposes of the question at hand, I believe it is fair to say that—blues-rock songs notwithstanding—the consideration of the 200-song rock corpus alongside the Bach chorales largely reaffirms the above analysis of the chord-to-chord properties of tonal harmonic successions: *In tonal-harmonic music, closely related root progressions are more common than distantly related root progressions—as measured on the circle of fifths—and the closest circle-of-fifths root motions exhibit directional asymmetry*. With these properties in mind, we can now look once again

to the statistical properties of chord-to-chord progressions in Ligeti's triadic pieces, analyzing them both for their own inherent syntactic properties and for traits shared with (and perhaps derived from) tonal-harmonic syntax.

STATISTICAL SYNTACTIC STRUCTURES IN LIGETI'S TRIADIC WORKS

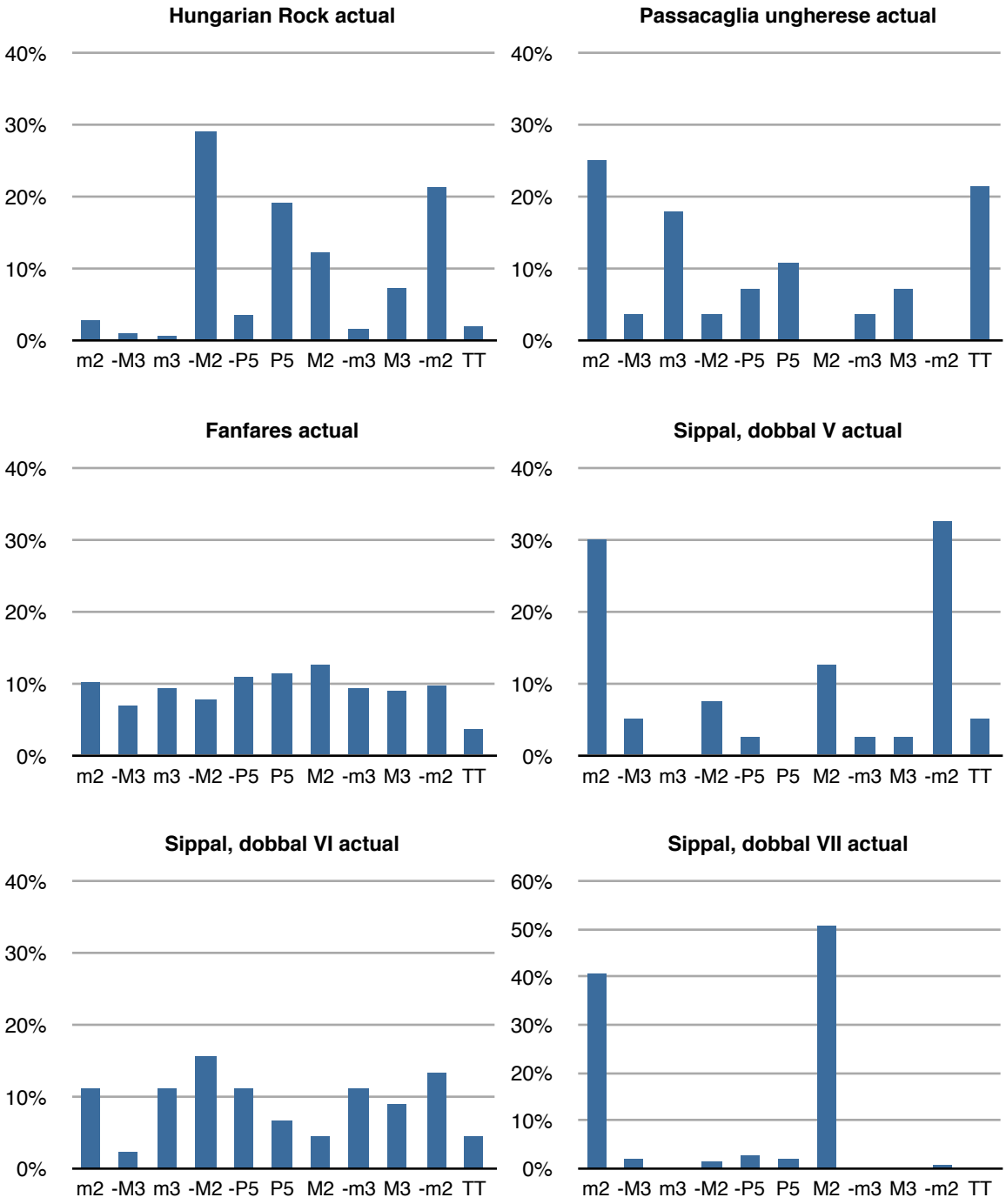


Figure 2.20. Probability profiles for root-progression distributions of Ligeti's triadic movements, arranged according to distance on the circle of fifths.

Table 2.4. Spearman coefficients of correlation (ρ) between root-progression probability profiles for Ligeti's triadic pieces and two tonal corpora—J.S. Bach's chorales (altered profile) and de Clercq & Temperley's 200-song rock corpus.

	Bach	de Clercq/ Temperley 200
Passacaglia ungherese	-0.14	-0.34
Hungarian Rock	0.07	0.26
Fanfares	0.64	0.54
SDN V	-0.52	-0.41
SDN VI	-0.03	0.04
SDN VII	0.33	0.40

Figure 2.20 reproduces the root-progression probability profiles for Ligeti's late triadic movements from figure 2.10, and table 2.4 provides the Spearman coefficients of correlation between these profiles and those of the tonal corpora for comparison. At first flush, a visual comparison of these profiles with those of the two tonal corpora, or an evaluation of the coefficients of correlation between the profiles of these movements and the tonal corpora, is not promising for the search for relationships with tonal structures. However, specific aspects of the profiles of specific pieces reveal some interesting relationships. First, "Fanfares" correlates moderately with the rock corpus and moderately highly with the Bach corpus. Though the slope of its curve is not nearly as steep as those of the tonal corpora, there is a notable preference for close circle-of-fifths root motions. A contrasting example is *Sippal, dobbal*, movement V. It exhibits moderate *negative* correlations with the two tonal corpora, suggesting, if not tonal structures, then composition in light of (or, rather, *opposite to*) standard tonal-harmonic syntax. *Passacaglia ungherese* exhibits the same property, though less pronounced. While the other three movements—*Hungarian Rock* and the last two movements of *Sippal, dobbal*—do not evidence tonal-syntactic structures or their opposite on the large scale, Ligeti clearly prefers some root motions over others in these movements; that is, these are not random structures but have meaning to the way in which harmonies are or-

dered. For example, in movement six of *Síppal, dobbal*, Ligeti generally prefers moderate circle-of-fifths distances over close or distant ones; and in *Hungarian Rock*, three of the four most common root intervals are shared with the tonal corpora (ascending-fifth and ascending- and descending-major-second progressions).

Analyzing all six movements in light of these tonal corpora, we find the following: One of the six movements ("Fanfares") demonstrates a high degree of correlation with tonal syntax when considering its harmonic structures on the large scale; one movement correlates weakly with the tonal corpora but privileges some of the same root motions (*Hungarian Rock*); two movements demonstrate a *negative* correlation with tonal syntax (*Passacaglia ungherese* and the fifth movement of *Síppal, dobbal*); and the remaining two movements (the last two movements of *Síppal, dobbal*), though not evidencing relationships to tonal music, still bear some markers of meaningful syntactic structure. Thus, we can say that most of these movements demonstrate *potential* influence of tonal music in the large-scale statistical properties of the harmonic successions of these movements, if not the precise structures, and all movements exhibit preference for certain kinds of root motion over others.

There is one last point of comparison between the harmonic syntactic structures of the tonal corpora and Ligeti's triadic pieces: directional asymmetry. In both tonal corpora, root motions—particularly the closer root motions on the circle of fifths—tend to favor one direction over another. Thus, descending fifths are more common than ascending fifths, ascending seconds more than descending seconds, and descending minor thirds more than ascending minor thirds. Major-third and semitone root motions tend to happen with similar frequency (once chord substitutions are accounted for in Bach's chorales). The question, then, is whether Ligeti's triadic pieces exhibit directional asymmetry, and, if so, whether these pieces prefer the same specific kinds of motions.

On the first point—whether these movements exhibit directional asymmetry—we can perform a simple statistical procedure to quantify and compare this property between movements. We can quantify this directional asymmetry by taking a probability profile, generating its inverse profile, and taking the coefficient of correlation between the profile and its inverse. If the profile is symmetrical, then its inverse profile (the mirror image of its profile chart) will correlate highly with the original; if the profile is asymmetrical, it will have a low coefficient of correlation with its inverse. For example, we can take the Bach (altered) profile and reverse its values to generate its inverse (table 2.5). Notice that the probability value for descending-fifth progressions in the profile is equal to the value for ascending-fifth progressions in the inverse profile, and vice versa.

Table 2.5. Root-interval probability profile for Bach chorales (altered version) and inverse profile.

Root interval	Bach	Bach (inverse)
P5	10.10%	43.68%
M2	15.71%	4.50%
–m3	8.68%	4.89%
M3	3.67%	3.14%
–m2	1.65%	2.41%
m2	2.41%	1.65%
–M3	3.14%	3.67%
m3	4.89%	8.68%
–M2	4.50%	15.71%
–P5	43.68%	10.10%

Table 2.6 shows the Spearman coefficient of correlation between the root-progression profiles for Ligeti's triadic movements (and the two tonal corpora) and their respective inverses. As we can see from these values, a number of Ligeti's triadic movements exhibit directional asymmetry. In fact, only one of Ligeti's movements, the fifth movement of *Sippal, dobbal*, has a higher degree of directional symmetry than the Bach corpus (and none have a higher degree of symmetry than the rock corpus). Thus, we can say with great confi-

dence that Ligeti's harmonic successions in these triadic movements exhibit directional asymmetry, just as the tonal corpora do—in fact, this property is more pronounced in Ligeti's harmonic successions than in the tonal corpora.

Table 2.6. Spearman correlation coefficients (ρ) between each movement's root-progression profile and its reverse.

Movement/corpus	Correlation with inverse
Passacaglia ungherese	-0.41
Hungarian Rock	0.21
Fanfares	0.08
SDN V	0.77
SDN VI	-0.18
SDN VII	0.08
Bach – unaltered	0.15
Bach – altered	0.61
dC/T 200	0.91

As can be seen from table 2.6, a number of Ligeti's triadic movements exhibit directional asymmetry. In fact, only one of Ligeti's movements, the fifth movement of *Síppal, dobbal, nádihegedűvel*, has a lower degree of directional asymmetry than the Bach corpus (and none have a higher degree of symmetry than the rock corpus). Thus, we can say with great confidence that Ligeti's harmonic successions in these triadic movements exhibit directional asymmetry, just as the tonal corpora do—in fact, Ligeti's harmonic successions tend to exaggerate this property of tonal successions.

Table 2.7. Intervallic directions favored according to root interval. Directions in parentheses are weakly favored; em dashes denote relative equality between directions.

	P5	M2	m3	M3	m2
Bach chorales	desc.	asc.	desc.	—	—
rock 200-song	desc.	(asc.)	—	—	—
Hungarian Rock	asc.	desc.	(desc.)	asc.	desc.
Passacaglia ungherese	asc.	desc.	asc.	asc.	desc.
Fanfares	—	asc.	—	(asc.)	—
Síppal, dobbal, nádihegedűvel V	(desc.)	asc.	(desc.)	(desc.)	(asc.)
Síppal, dobbal, nádihegedűvel VI	desc.	desc.	—	asc.	(asc.)
Síppal, dobbal, nádihegedűvel VII	—	asc.	—	—	desc.

However, Ligeti does not consistently favor the same directions of the same intervallic distances in these movements as evident in the tonal corpora. In *Passacaglia ungherese*, on the three key root intervals (fifths, major seconds, and minor thirds), Ligeti favors the opposite direction of the tonal corpora, and he heavily favors ascending over descending semitones where the tonal composers tend towards equality. In *Hungarian Rock*, Ligeti again favors the opposite direction as the tonal composers for fifths and major seconds, and he favors descending major-third and descending semitone progressions where the tonal composers tend towards equality. "Fanfares," as mentioned above, is relatively undifferentiated, though Ligeti does weakly favor the "tonal" direction for major seconds, the intervallic distance with the greatest degree of differentiation. *Síppal, dobbal, nádihegedűvel*, movement V, is also relatively flat, but Ligeti favors the tonal direction for the three key intervallic distances. In movement VI, the two largest differentiations are non- tonal: Ligeti favors descending over ascending major seconds and ascending major thirds rather than relative equality. Lastly, movement VII contains more than 90% ascending semi- and whole-tone progressions. While this means a tonal favoring of ascending over descending seconds, the harmonic successions of this movement can hardly be said to resemble tonal harmony. Thus, we may conclude on this point that though Ligeti's successions of tertian harmonies in these

movements exhibit directional asymmetry—as tonal music does—the specific directional preferences in these movements do not follow after the precedence of tonal-harmonic music.

SUMMARY

Let me now summarize the findings of this statistical study. I have demonstrated that it is possible to analyze the harmonic successions of triadic music without recourse to a controlling tonic, and that such analysis allows for insightful comparisons between tonal-harmonic syntax and the syntactic structures of compositions that do not make use of global or local tonal centers.

By way of such tonic-agnostic root-motion analyses, we found that tonal music, exemplified by the Bach chorales and a corpus of 200 rock songs, exhibits a bell-curve shaped distribution of chord roots on the circle of fifths (centered around tonic), a privileging of short distances (on the circle of fifths) between successive chordal roots, and directional asymmetry that is particularly strong on the closest circle-of-fifths progressions. Further, we found that many of these properties are descriptive of Ligeti's triadic works, as well. These works, with some notable exceptions, exhibit a preference for close harmonic progressions on the circle of fifths (or the opposite—both being strong potential markers of tonal influence on his syntactic structures) and directional asymmetry (though of a different sort than that exemplified by the tonal works).

This suggests that Ligeti's triadic works possess a high degree of structuring to their harmonic successions, and that these structures exhibit significant relationships with tonal harmonic structures, sometimes in rather specific ways. However, as we consider whether these movements can be said to have a syntax, and to what extent these works exhibit properties similar to tonal syntax, some questions remain. For instance, though we have seen clear preference for certain types of root motion over others in each of these movements, the statistical data presented today does not provide information about how these different progression types are employed within these movements. Is the root-interval content of these

movements uniform? Or are certain progressions privileged in some passages and suppressed in others? Still more interesting: are certain chords or progressions privileged in some positions within phrases and suppressed in others? In other words, can these progression types be seen to play functional roles within the harmonic structures of the movement—articulating moments of stability and instability, mobility and closure? Such questions are fundamental to an understanding of Ligeti's harmonic structures and their potential relationship to tonal structures, and they cannot by fully answered by the present statistical analysis. In addition to questions unanswered by this analysis are questions raised by this analysis. These are often specific to particular movements. For instance, the statistical analysis of this study may lead us to ask why over half of the progressions between tertian chords in *Hungarian Rock* involve root motions of one or two steps on the circle of fifths (like the tonal corpora) but very few of those progressions are descending-fifth root motions (the most common progression in the tonal corpora)?

Chapters 3–5 lay out these questions and explore them in detail.

III. ANALYSIS – THE 1978 HARPSICHORD WORKS

The statistical root-motion analysis of the six heavily triadic pieces from late in Ligeti's career suggests a high degree of structuring to their harmonic successions and the strong possibility of a relationship between Ligeti's harmonic structures and those typical of tonal music. However, as we consider whether these movements can be said to have a syntax, and to what extent these works exhibit properties similar to tonal syntax, two questions remain. The first is simply to ask, what do these general statistical properties tell us about individual pieces? Or, rather, how do these statistical patterns play out in the large-scale forms and specific passages of these pieces? Until we examine the way that Ligeti's use of tertian harmonies plays out in actual passages and articulates small- and large-scale formal structures, the statistical data of Chapter 2 is rather limited in what it can tell us about this music.

The second question regards the two-part definition of harmonic syntax presented in Chapter 1 and referred to in Chapter 2, which required that a syntactic system possess both norms for the ordering of harmonies into successions and criteria for stability and instability, or mobility and closure. The data in Chapter 2 suggests that in each movement, there are meaningful principles according to which harmonies are ordered, but the question of harmonic stability and instability remains unanswered. Are there clear criteria for harmonic stability and instability in these triadic pieces? In Chapters 3–5, I seek to answer these two questions regarding the same six movements discussed in Chapter 2, proceeding in chronological order, examining the harmonic and formal structures of the two works for harpsichord (*Hungarian Rock* and *Passacaglia ungherese*, Chapter 3), "Fanfares" (Chapter 4), and the final three movements of *Síppal, dobbal, nádihegedűvel* (Chapter 5).

HUNGARIAN ROCK

Figures 3.1 and 3.2 provide the root-interval profiles for *Hungarian Rock and* for the de Clercq/Temperley 200-song rock corpus, respectively.

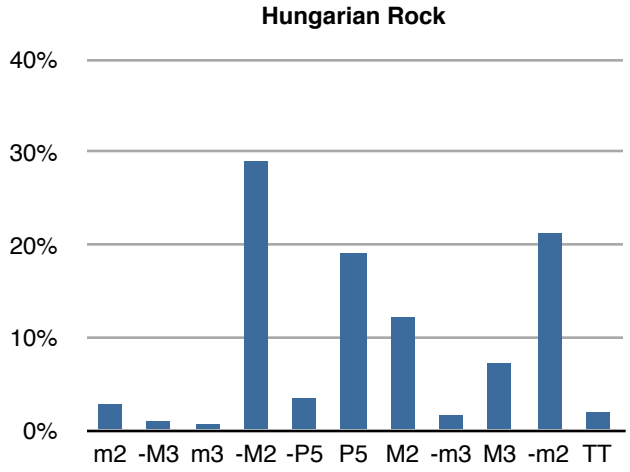


Figure 3.1. Root-interval probability profile for *Hungarian Rock*, arranged according to distance on the circle of fifths.

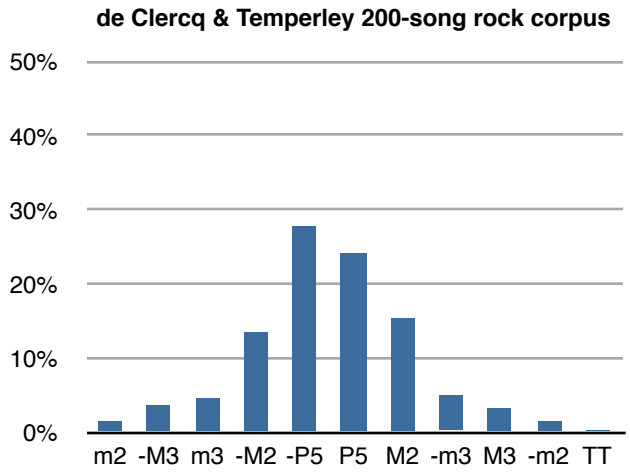


Figure 3.2. Root-interval probability profile for the successions of chords found in de Clercq & Temperley's 200-song rock corpus, arranged according to distance on the circle of fifths.

Though the coefficient of correlation between these two profiles is low—0.26 (and 0.07 between *Hungarian Rock* and the Bach corpus)—there is a significant relationship: over 50% of the root intervals in the rock corpus (and the Bach corpus) and *Hungarian Rock* are one or two steps on the circle of fifths, and three of the four most common root intervals in the

Hungarian Rock and rock-corpus profiles are the same—ascending-fifth and ascending- and descending-major-second progressions. However, there is one glaring difference—a demonstrable absence of descending-fifth progressions in *Hungarian Rock* relative to the two tonal corpora. This raises an analytical question: Why do over half of the progressions between tertian chords in *Hungarian Rock* involve root motions of one or two steps on the circle of fifths, like the tonal corpora, but very few of those progressions are descending-fifth root motions, the most common progression in the tonal corpora? In other words, why does *Hungarian Rock* bear such a strong resemblance to tonal root-motion structures, but lack the most pronounced feature of tonal root-motion structures?

An answer to this question, however, is dependent on the answer to another question, presented at the end of Chapter 2. *Is the root-interval content of this movement uniform? Or are certain progressions privileged in some passages and suppressed in others?* Indeed, while much of the movement possesses a relatively uniform distribution of root intervals, the distribution is not uniform throughout. That is, the profile of figure 3.1 does not reflect the preferred progressions throughout the entirety of the movement. Though the descending-fifth root progression appears infrequently throughout most of the movement, it appears prominently and frequently in one particular passage. This contrast is key to the large-scale formal structure of the piece.

According to a number of different musical parameters, *Hungarian Rock* can be divided into two unequal sections. *Hungarian Rock*, subtitled "Chaconne," is a rapid ground-bass-variation movement, with the bulk of the movement—the first 177 of 184 bars—built upon a repeated four-bar progression of block chords in the left hand (figure 3.3). This four-bar ground is comprised of dyads (and doubled dyads), triads, and incomplete dominant-

seventh chords (which sometimes take the form of diminished triads) all built on the same five-note bass ostinato (figure 3.4).[7]

Figure 3.3. Four-bar ground of *Hungarian Rock*.

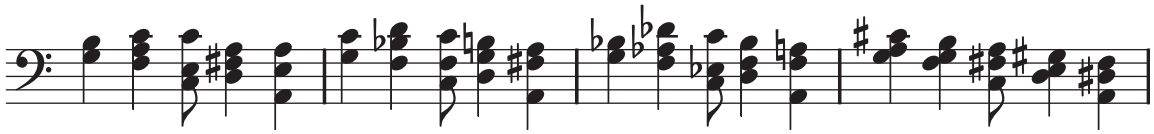
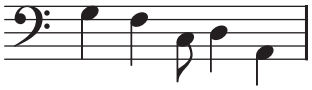


Figure 3.4. One-bar ostinato bass of *Hungarian Rock*.



In m. 178, this ground disappears, and Ligeti provides us with a concluding passage that is very different from the rest of the movement. First, there is a clear difference in texture: The music of mm. 1–177 contains a fast, rhythmic ground composed of dyads, triads, and seventh chords, coupled with a melodic line. For most of the movement, this line is a single melodic voice, and at times, it sounds improvisatory. This line generally grows in its own rhythmic complexity, and in the complexity of its contrapuntal relationship with the ground until the high point of m. 177. At times, especially as it approaches m. 177, the melodic line splits into two-voice counterpoint, or mimics the left hand with brief block-chord passages of its own. Altogether, there are few moments in the melody that we could consider points of rest or

[7] The triads of mm. 1–3 are all major triads, with the ostinato notes forming the bass notes for triads in root position (m. 1), second inversion (m. 2), and first inversion (m. 3). The dyads in those bars can be seen as incomplete triads according to the same structural scheme. The fourth bar extends this pattern by taking the bass notes as sevenths of incomplete third-inversion dominant seventh chords. Ligeti's sketches for this piece support the incomplete-triads-and-seventh-chords interpretation, as early drafts of this ground were formed entirely of complete major triads and dominant seventh chords in the inversion arrangement described here. Though the omission of some of these pitches allows Ligeti a degree harmonic freedom over the course of the movement, the ground in use here heavily constrains Ligeti's harmonic options, leading to the relative uniformity of the root-progression profile throughout the 177 bars of the movement controlled by the ground.

cadence, and there are no points at which the block chords of the ground come to rest. In contrast, the last seven bars contain a much slower harmonic progression (indeed, these last seven bars constitute nearly one-fifth of the duration of the movement in some recordings) and a slow, free, recitativo-style melody with frequent points of arrival or cadence.

In addition to the drastic contrast in texture, there is a significant change in the types of harmonic progressions employed between the first 177 bars and the last seven bars. Here is the root-interval distribution for the last seven bars of the piece:

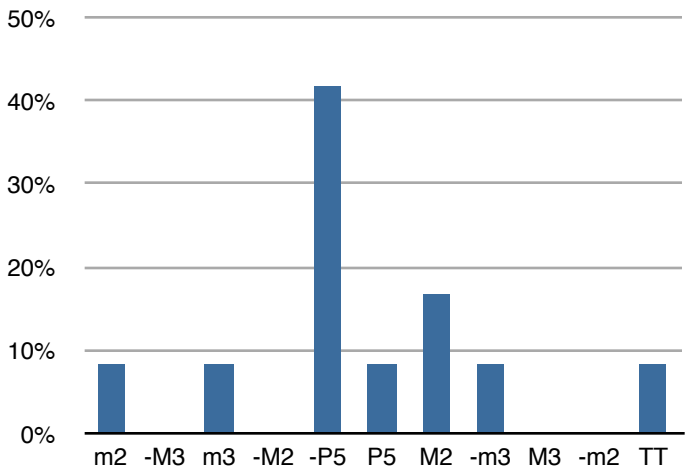


Figure 3.5. Root-interval probability profile for mm. 178–184.

In this last section, the descending-fifth progression that has been conspicuously absent from the rest of the movement appears, dominating the root progressions of the quasi-recitativo section. Fully five of the thirteen root progressions—more than a third—are descending fifths. The next highest value (the only other root motion to occur more than once in this passage) is the ascending major second.

This profile, then—with its overwhelming plurality of descending fifths, and its slight privileging of ascending seconds over other common progressions—bears a striking resemblance to the Bach (altered) profile.

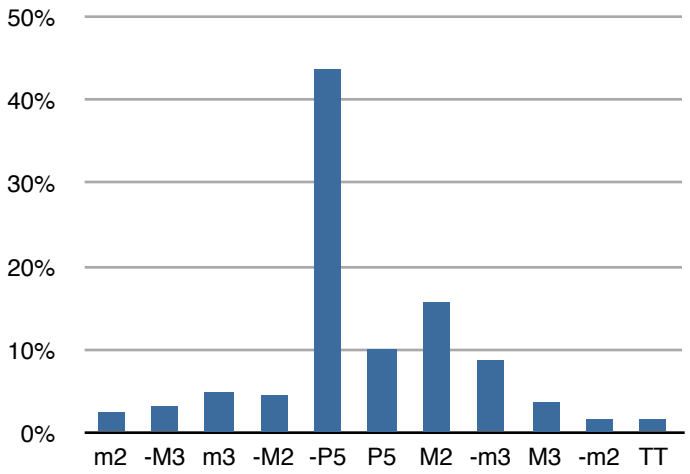


Figure 3.6. Root-interval probability profile for J.S. Bach's four-part chorales, arranged according to distance on the circle of fifths.

Keeping in mind the near-random relationship between the profile for the entirety of *Hungarian Rock* and the Bach chorale corpus ($\rho = 0.07$) and the relative absence of descending fifths in the movement as a whole, the strong relationship between tonal root motions and those of the final section of this piece and the prolific occurrence of descending fifths in that passage suggest both composition in light of tonal-harmonic practices and a special formal function for the descending-fifth root progression in this movement. That formal function provides us with an answer to the second of the two overarching questions of this chapter—*are there clear criteria for harmonic stability and instability in these triadic pieces?*—and sheds light on the relationship of Ligeti's syntactic structures to those of tonal music. In what follows, I explore in detail all of Ligeti's descending-fifth root motions in this piece and their functional role within the form of the movement before returning to the general questions of stability/instability and relationship to tonal-syntactic structures.

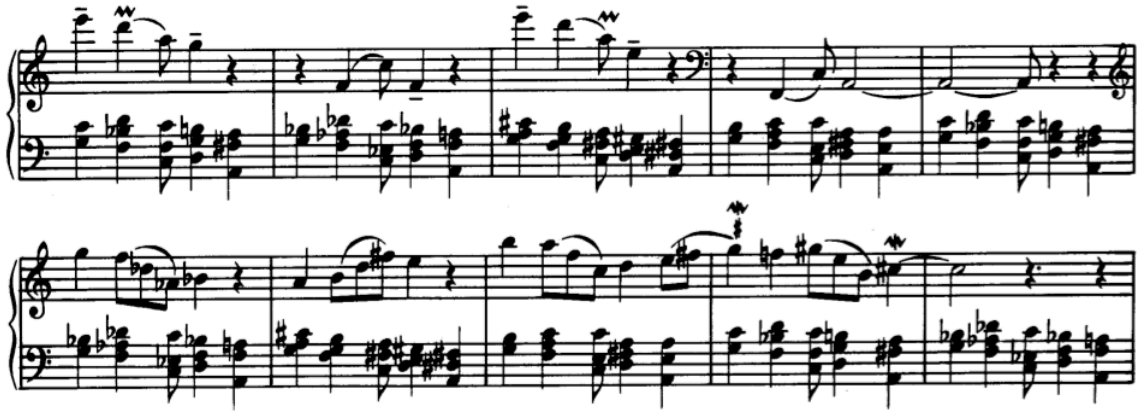
According to the method of harmonic reduction for this movement laid out in Chapter 2 (considering only co-articulated chords), there are 11 descending-fifth progressions in the entire movement (which contains a total of 895 chords in its harmonic reduc-

tion)—seven before m. 178, and four after. Allowing for tied-over notes as chord tones (for example, considering the final chord of m. 10 to be a D-major chord, rather than an F-sharp/A dyad), there are a total of 15 descending-fifth progressions—10 before m. 178, and 5 after. In either case, about a third of the root progressions in the final seven bars are descending fifths, but only a pittance of descending fifths occupy the part of the movement dominated by the ground. Following is a list of the 15 descending-fifth progressions in the movement, with those not recognized by the Chapter-2 harmonic reduction labeled by an asterisk.

mm. 6–7: D major to G minor*
mm. 10–11: D major to G minor*
m. 13: A minor to D major
m. 14: D minor-seventh to G major
mm. 50–51: D major to G minor*
mm. 68–69: B dominant-seventh to E minor
mm. 86–87: D major to G minor
m. 149: A minor-seventh to D major
m. 159: D flat dominant-seventh to F-sharp diminished-seventh
mm. 160–161: B dominant-seventh to E minor-seventh
m. 179: A dominant-seventh to D major
m. 180: B dominant-seventh to E major*
m. 182: G dominant-seventh to C major
mm. 182–183: C major to F major
m. 184 (last bar): B-flat major to E-flat dominant-seventh

None of the descending-fifth progressions that precede the break at m. 178 are part of what one might call cadential progressions. None of them come at the arrival of some local harmonic goal prepared by previous harmonic or formal structures; none of them even come at the moments where one might find beginnings or ends of melodic units (such as the introduction of a new melodic motive at m. 35—see figure 3.7—the new units that begin in mm. 46 and 52 after a long melodic arrival note, the new units that begin in mm. 61 and 67 after a punctuating block-chord gesture in both hands, etc.).

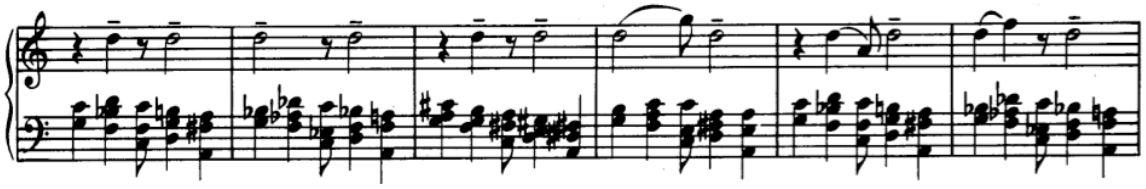
Figure 3.7. *Hungarian Rock*, mm. 30–39. One large melodic unit ends with an arrival on an extended low note in m. 33, and a new unit begins with new melodic material and a return to the upper register in m. 35.



Further, none of these progressions are followed by tertian chords that could belong to the same key as the two chords involved in the fifth descent. Instead, these are mid-phrase progressions in a piece that already moves incredibly quickly through its harmonies and diatonic collections and that has very weak articulation of phrase-length formal units; no formal weight are given to the descending-fifth progressions that precede m. 178.

This trait of these progressions is enough, in my mind, to eliminate any structural significance for these progressions when one listens to the movement. They simply go by too fast to be heard as critical moments without emphasis from other parameters of the music. However, there are other factors in most of these fifth descents that attenuate their structural significance and/or their relationship to fifth descents in tonal music. For instance, three of the fifth descents before m. 178 are not comprised of completely co-articulated chords (noted by asterisks in the above list; see figure 3.8).

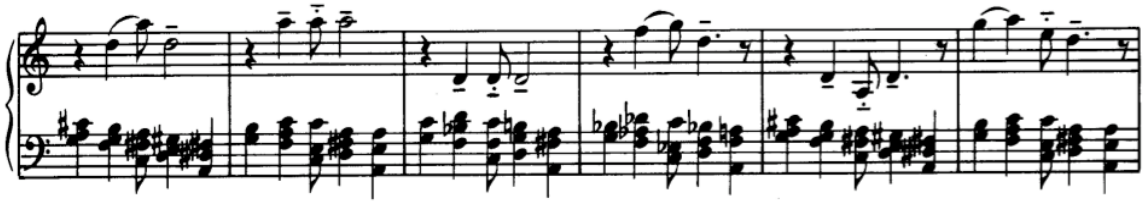
Figure 3.8. *Hungarian Rock*, mm. 6–11. D-major-to-G-major progressions from m. 6 to m. 7 and m. 10 to m. 11.



This is not necessarily of structural significance; however, the tied-over (and thus barely audible, if at all, on the harpsichord) pitch in all three cases is the root of the first (i.e., potential dominant) chord, a significant omission, particularly if looking for potential sources of additional emphasis for these progressions.

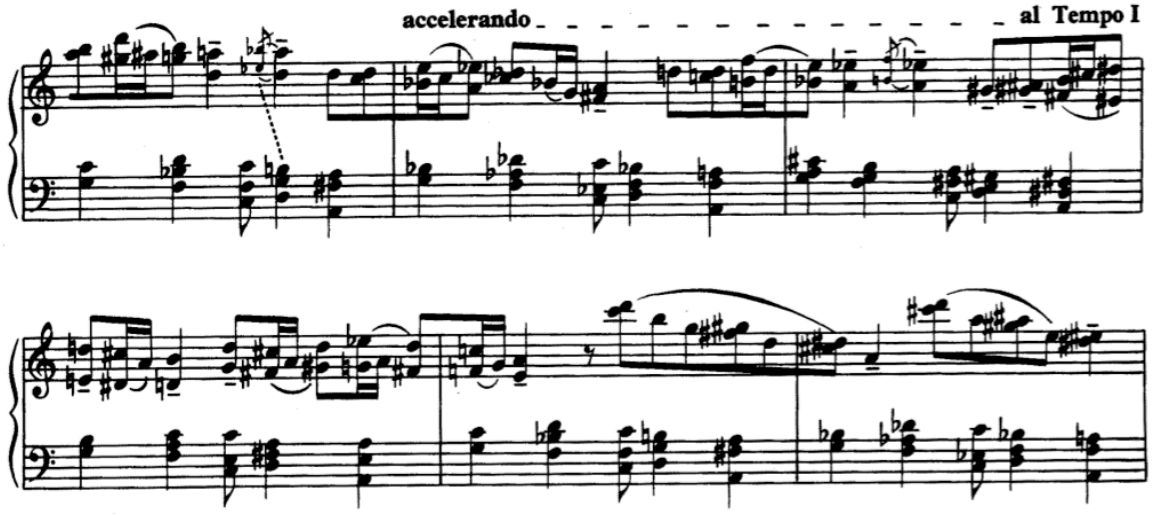
Three more of these progressions, though involving complete chords, omit something else that would provide it with significant tonal-syntactic thrust toward the following chord: the leading tone. That is, in mm. 13, 14, and 149, the first chord is a minor chord or a minor-seventh chord.

Figure 3.9. *Hungarian Rock*, mm. 12–17. Root motions by descending fifth lacking potential leading tone: m. 13, A minor to D major; m. 14, D minor-seventh to G major.



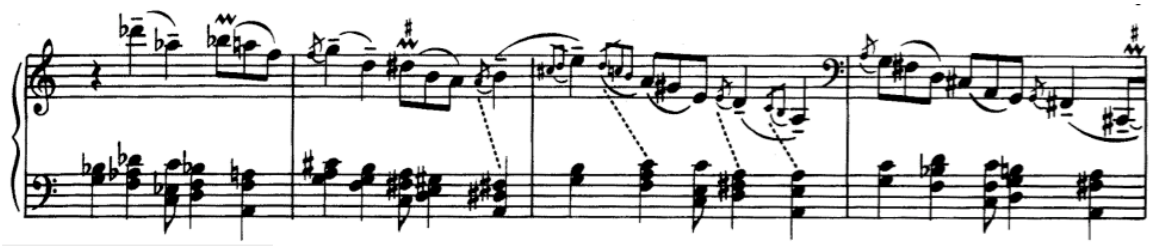
Two more progressions attenuate the potentially strong tonal motion of the descending fifth through arriving on an unstable chord: the progression in m. 159 lands on a fully diminished-seventh chord, and the progression in mm. 160–161 lands on a minor-seventh chord.

Figure 3.10. *Hungarian Rock*, mm. 158–163. Root motions by descending fifth landing on a dissonant sonority: m. 159, D-flat dominant-seventh to F-sharp diminished-seventh; mm. 160–161, B dominant-seventh to E minor-seventh.



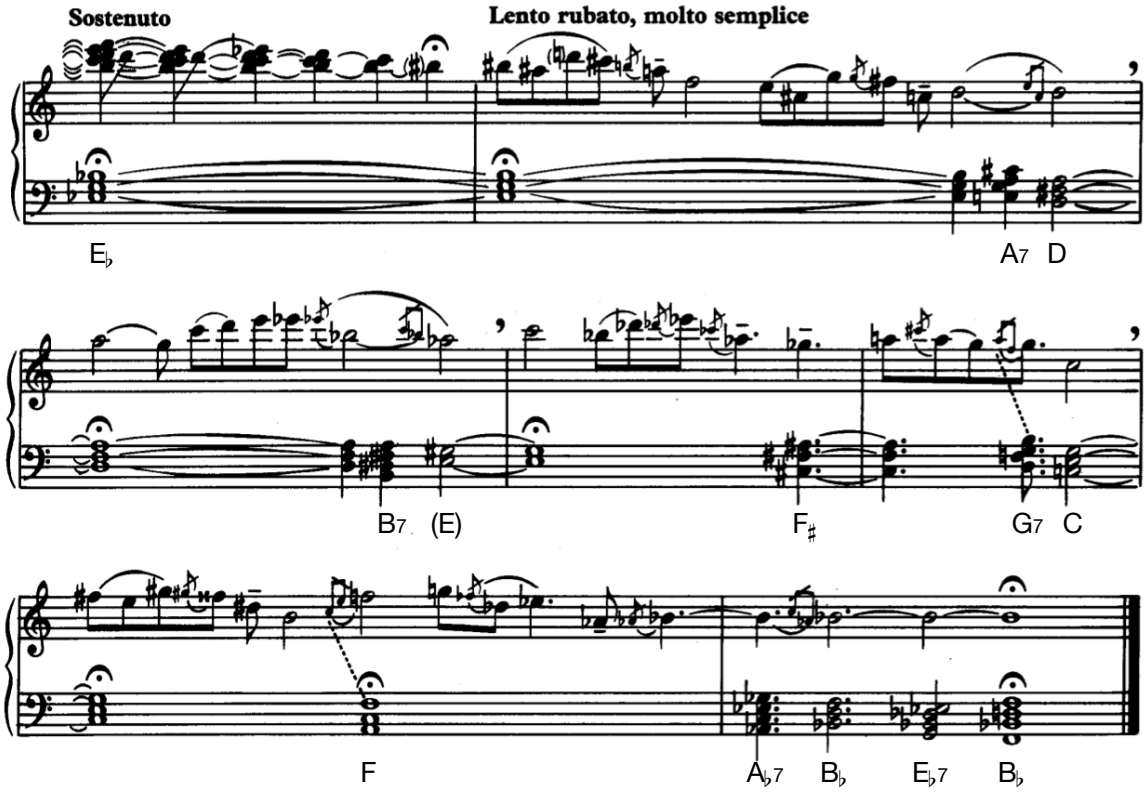
Two progressions before m. 178 are left: mm. 68–69 (figure 3.11) and mm. 86–87. Though these are dominant-seventh-to-minor-tonic progressions where roots descend by fifth, there is little else to grasp onto in an attempt to attribute harmonic or formal strength to these progressions. As stated above, the progressions go by so quickly that without extra emphasis, even non-attenuated progressions like these two do not possess enough structural weight in itself to make a formal or syntactic claim.

Figure 3.11. *Hungarian Rock*, mm. 67–70. B dominant-seventh to E minor from m. 68 to m. 69. (Note the conflict between the D-natural grace note in the melody and the D-sharp leading-tone in the ground.



The story changes drastically at m. 178. After over 800 chords have passed by in a little over four minutes—including no strong root descent by fifth—everything slows, and Ligeti draws our attention almost entirely to the harmonic progressions. Each phrase-like gesture in the recitativo-like melody is punctuated by a two- or three-chord progression, and each of these progressions involves a root descent by fifth, frequently landing on a root-position triad. We see this in m. 179, with an arrival on D major; in m. 180, with an arrival on E major (without its fifth); in m. 182, with an arrival on C major; and in m. 184, with an arrival on B-flat major (this is not the goal of a fifth descent, but I will discuss this shortly). Further, if we step over the incomplete E arrival, there is a stepwise descent from the E-flat-major chord that opens this passage (m. 178) through arrivals on D major (m. 179) and C major (m. 182) to B-flat major (m. 184). Lastly, the B-flat goal is prepared by a circle-of-fifths sequence, G^7–C–F, which prepares the coming of B-flat. To emphasize its arrival, Ligeti inserts a dilatory A-flat^7 chord, and then prolongs B-flat with an E-flat^7 chord, as if to carry the sequence one chord too far only to return to the goal of both the circle-of-fifths sequence and the stepwise descent. The fifth-descent root progression, then, plays two key structural roles in these final bars: first, fifth-descent root progressions emphasize the structurally important chords in the root descent from E-flat to B-flat; and second, a sequence of fifth descents prepares and prolongs the arrival of the final root of the movement, B-flat.

Figure 3.12. *Hungarian Rock*, mm. 178–184 with chordal analysis.



In this movement as a whole, triads and seventh chords are not only prominent parts of Ligeti's "harmonic palette," but the kinds of progressions between them are important to the generation of harmonic mobility and closure, and thus to the articulation of form. Ligeti composed a ground with a harmonic structure that led to a privileging of certain harmonic progressions over others throughout the bulk of the movement: namely, close motions on the circle of fifths (ascending fifths and ascending and descending major seconds) and descending semitones, at the expense of other root motions. Some of these privileged progressions are also privileged in tonal music (fifths and major seconds), but there is one glaring difference between *Hungarian Rock* and tonal music: a near absence of root descents by perfect fifth. However, this absence of strong fifth descents throughout the first 177 bars of the movement prepares the use of frequent strong, prominent fifth descents in the final bars of

the movement. Through the use of the "vocabulary" of tonal music and the use of some elements of its syntax (privileging some of the root motions privileged in tonal music), Ligeti plays on our expectation of that hallmark of tonal syntax—the fifth descent. By making reference to a familiar musical practice that privileges that progression, but withholding it for most of the movement, Ligeti augments its impact when it finally appears and intensifies its functional ability to articulate moments of arrival and to punctuate the close of the movement. The result is a clear projection of mobility and closure within the movement, which is dependent on listener knowledge of standard harmonic-syntactic structures from traditional tonal musics.

PASSACAGLIA UNGHERESE

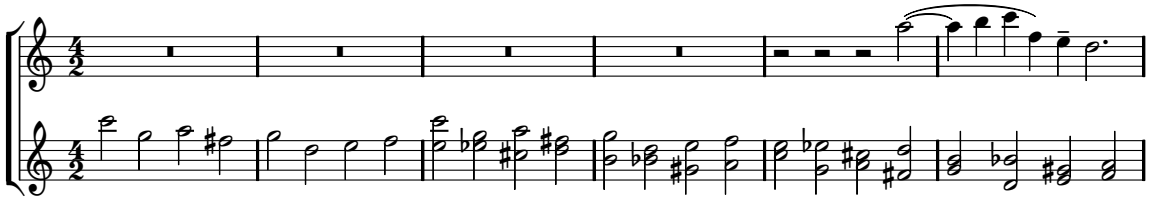
Following shortly after the completion of *Hungarian Rock* was Ligeti's completion of *Passacaglia ungherese*. These two works share many traits—instrumentation, a ground-bass structure, a relatively brief duration, and the use of triadic harmonies. They also both employ harmonies and harmonic progressions in ways that are fundamental to the articulation of large-scale form. However, in *Passacaglia ungherese*, the form and the way in which Ligeti constructs it is more complex, as are the specific ways in which he employs harmony in service of that form. Thus, I will spend a good deal more time discussing this piece than its 1978 counterpart. In what follows, I lay out the large-scale formal structure of the movement, the relationship of the ground and the melodic line to that form, and the implications of Ligeti's choice of quarter-comma mean-tone temperament for this piece. Then, with that context in mind, I proceed to explore the harmonic structures of the movement, their syntactic nature, and their relationship to traditional tonal harmonic structures. In addition to the structures of the finished work, elements of Ligeti's compositional process—gleaned from the preserved sketch material—factor into this analysis, shedding light on the significance of the structures found in the piece, and aiding the interpretation of the ways in which they function in the larger form of the movement.

FORM AND GENERAL STRUCTURAL PROPERTIES

The general structure of this single-movement work is just as its title suggests: there is a repeated figure—the ground—above which occurs an independent melodic line. The ground is formed of two identical four-bar lines, the second following two bars after the first. This line descends just over an octave and then is repeated, transposed an octave lower. The result is a two-bar succession of eight dyads that repeats with the voices inverted (the top

succession of eight tones descends an octave to become the new bottom voice, while the lower succession of eight tones repeats to become the new top voice).

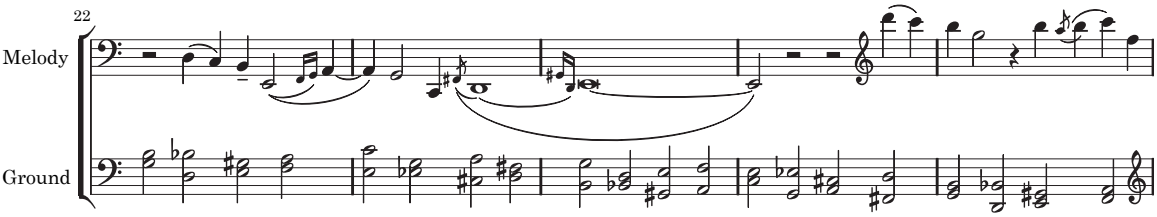
Figure 3.13. *Passacaglia ungherese*, mm. 1–6 (ground on bottom staff, melody on top staff).



After twelve bars (or six iterations of this two-bar pattern), the ground returns to the original register at the top of the treble staff and begins a new descent. The movement contains six such descents following immediately, one after the other.

The melodic strain in this movement, though more improvisatory in nature, has a similar pattern of repeated descents. These are less regular, however, and do not coincide with the ground's return to its original register for a new descent. These melodic descents begin at mm. 6, 26, 38, 53 (though this could also be considered a bump in the general descent from m. 38 to m. 55), and 56. This pattern of repeated descents breaks down around mm. 64–65, where the melody becomes both more frantic and less directed toward a specific goal. At m. 71, however, a new, rather rapid descent begins, which hooks around to ascend for the last bar and a half.

Figure 3.14. *Passacaglia ungherese*, mm. 22–26. Cadence at end of first melodic descent, beginning of second melodic descent.



The melody can also be divided according to the general duration of its constituent tones. The opening section, from m. 6 to m. 52, is comprised mainly of quarter notes and half notes; mm. 53–60 are dominated by eighth-note figures; and mm. 61–70 contain numerous sixteenth-note flourishes. The last four bars reverse this tendency of durational diminution, as the movement settles to a close. Again, the breaks in the melody according to this division do not correspond to the registral shifts in the ground. And only if m. 53 is granted status as the beginning of a new descent pattern do any of the descent pattern beginnings coincide with changes in durational content. Thus, though there are multiple ways in which the form of this movement may be divided into discrete sections, the fact that the melody and ground divide at different points, and the fact that the melody divides at different points according to different parameters give the movement a continuous flow. Further, the acceleration of melodic rhythm propels the movement forward until the last four bars, which settle down in preparation of the final cadence.

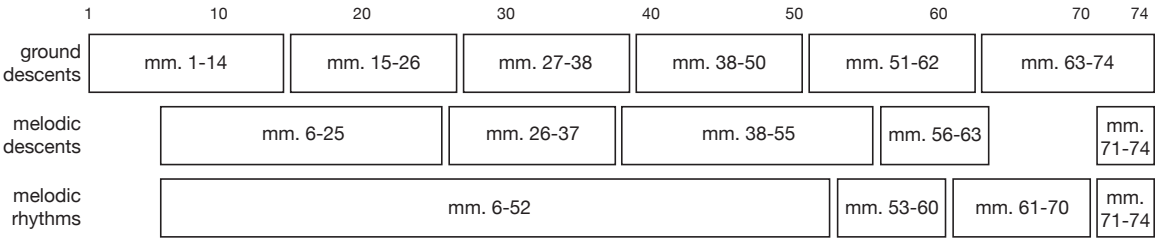
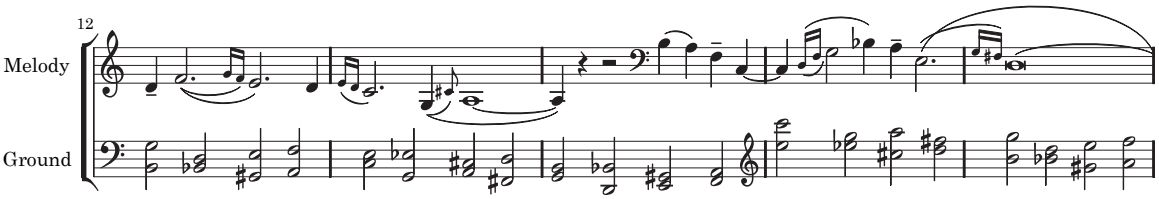


Figure 3.15. Large-scale structure of *Passacaglia ungherese*, according to long-range descent patterns and sudden changes in general rhythmic duration.

In spite of these overlapping structures and the resulting continuity and directionality of the movement's flow, there are points of arrival in the movement that stand out and allow us to hear—rather clearly—a three-part large-scale structure. These three divisions are punctuated by three primary points of melodic cadence: mm. 25, 49, and 74 (see figure 3.14 above for the cadence at m. 25), dividing the piece almost exactly into thirds. Each of these cadences involve a low, sustained note in the melody, followed by a rest (or the end of the

piece) and a new melodic strain that begins in a higher register, focuses on different motivic content, and/or operates at a different rhythmic pace (or the end of the piece). As we will see later in this analysis, the harmonic properties of these points of strong melodic termination also contribute to the impression of these moments as cadences or points of closure. There are also three secondary cadential moments that are similar to the primary melodic cadences, but that move more quickly into the next melodic phrase, exhibit a less dramatic register shift, and/or follow with a restart of the same motivic material. These secondary cadence points come at mm. 14, 37, and 55.

Figure 3.16. Secondary melodic cadence at m. 14.



Within this structure, Ligeti gives significant emphasis to triads and dyads that are traditionally held to be consonant intervals, primarily in the ground. As mentioned above, beginning in m. 3, both voices of the ground sound together—and they continue to for the remainder of the piece; each interval generated by the two voices is an instance of ic4, a major third or a minor sixth. Thus, at any point in the work from m. 3 to the end, a traditionally consonant harmonic interval is sounded in the ground. The melody frequently forms a triad with the ground, but, of course, the combination of melody and ground is not always consonant. Of the 575 ground dyads performed in this piece, 101 of them form a major or minor triad with the melody at the point of articulation (still others form a triad with melodic tones that enter after the dyad is articulated or with melodic tones that are tied over from a previous beat, and a number of other dyads form one of the usual diatonic seventh chords with

the melody). Though major and minor triads only account for about 18% of the co-articulated chords in this piece, this is still a significant presence of consonant triadic material, especially in the context of Ligeti's compositions over the previous two decades. Further, the first and last sonorities created by the combination of melody and ground are major triads (D major in m. 5; E major in m. 74), and the entirety of the ground leading up to the entrance of the melody in m. 5 is comprised of single tones or harmonic consonances.

It is also important to note that Ligeti instructs the performer, if possible, to perform this work in quarter-comma mean-tone tuning. In a mean-tone temperament, perfect fifths are tuned in a perfect 3:2 ratio and then *tempered*, or made smaller, by some degree, in order to make the major thirds more pleasing than they are in Pythagorean tuning (a common historical predecessor to mean-tone that utilized pure fifths and, as a result, very large major thirds). In quarter-comma mean-tone temperament, the fifths are each tempered by one-quarter of the syntonic comma (the difference between a pure (5:4) major third and the Pythagorean third (81:64)—a ratio of 81:80). The result is pure major thirds and only slightly out-of-tune fifths. Those who used quarter-comma, sixth-comma, and other mean-tone temperaments believed the impurity of the fifths to be less offensive than the impurity of the thirds in Pythagorean tuning, and thus it was better for triadic music. Because of the nature of the diatonic scale in the chromatic system and the mathematical relationships between the various pure, or just-tuned, consonances, not all instances of a given interval class can be pure and still maintain octave equivalency. In the case of quarter-comma mean-tone, this means that only eight of the twelve major thirds (when not using a split-chromatic keyboard) will be pure; the other four (spelled as diminished fourths—such as B/E-flat, C-sharp/F—in the *Passacaglia ungherese*) are *wolf* intervals, dyads that are very far from pure, and thus sound well out-of-tune.

The use of mean-tone temperament, generally speaking, calls up associations with traditional triadic harmony. First of all, mean-tone temperament is designed with music based on the diatonic scale and populated with triadic harmonies in mind—music that not only privileges tertian chords, but also privileges certain triads, triadic progressions, keys, and patterns of modulation over others. In other words, mean-tone tuning is designed for music that privileges certain elements of tonal "vocabulary" and tonal "syntax."

Because of the structure of the chromatic scale in mean-tone tuning, it also eliminates twelve-pitch-class equivalence. On single-chromatic keyboards like the one prescribed by Ligeti, chords, melodies, and passages cannot be transposed to all of the twelve tonal centers with equally good results. For example, a passage that sounds good in C major may not sound as good in E major, since the dominant chord of E (B major) contains a wolf third between root and third (the leading tone). Such a passage would likely sound even worse in F-sharp major, where the tonic, subdominant, and dominant triads all contain wolf thirds. For centuries, composers of triadic music have worked in and around these situations, employing various solutions and/or grounding their repertoire in a less than complete set of keys, as the case may warrant, until equal temperament became standard.

Atonal and serialist music, on the other hand, necessitate equal temperament. Since all twelve pitch classes are functionally equivalent, they have identical intervallic relationships with the other pitch classes in the chromatic system, and all interval classes are equivalent, no matter what their constituent pitches or their enharmonic spelling. Thus, at the very least, mean-tone tuning at this point in Ligeti's career puts him outside the realm of standard atonal practice, even more so than previous pieces in which he incorporated non-standard tuning (since they involved non-standard-tuned pitches in addition to the usual 12-pc chromatic system); at the most, the use of mean-tone tuning makes properly atonal or serial com-

position impossible and—in conjunction with other elements from the tonal-harmonic universe—draws strong associations with and generates implications from tonal harmony.

With this bird's-eye view of the movement's large-scale structure in mind, as well as the properties and preliminary implications of the work's mean-tone tuning, let's now turn to an analysis of this movement's harmony, seeking to find evidence for syntactic structures and for relationships with tonal-syntactic structures. This analysis will begin with an exploration of the dyad cycle that forms the ground, as it is the basis for all of the harmonic structures in the movement. The compositional process revealed by Ligeti's sketches plays a primary role in this analysis, as we can see the choices Ligeti made and some of the other potential options he considered, helping us better understand the specific structures that made it into the published score. Then, we will consider Ligeti's idiosyncratic employment of consonance and dissonance. Finally, we will consider the way in which these structures are used to generate harmonic expectation and articulate formal structures in *Passacaglia ungherese*. In this analysis, we will find evidence for Ligeti's attentiveness to the harmonies used and their ordering in the ground, two ways in which Ligeti's composition differentiates elements of harmonic stability and instability, and a system of harmonic expectancy that is fundamental to the formal structures of the movement on both the small and large scales. In all of these things, meaningful syntactic structures and engagement with some of the basic properties of tonal-syntactic structures can be readily seen.

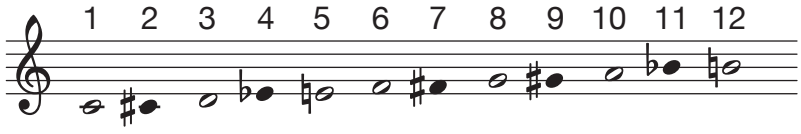
THE CONSTRUCTION OF THE GROUND

In the *Skizzen* folder of materials for *Passacaglia ungherese* in the Ligeti Collection at the Paul Sacher Stiftung, there is one page of preliminary sketches, followed by a complete draft of the piece with some discarded material crossed out. The non-discarded material in that draft is the final version (of the notes and rhythms) that is included in the fair copy and

the published score, with the addition of Ligeti's hand-written performance notes (articulation and tempo information, primarily).

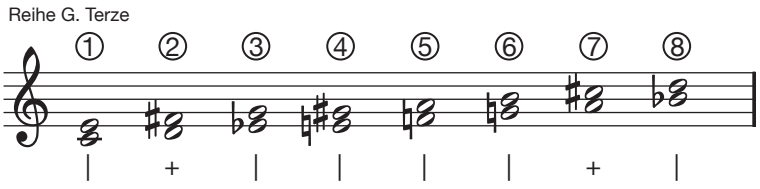
The single page of preliminary sketch material, however, is of great interested for a study in harmony and harmonic syntax. The top of the page contains a chromatic scale that differentiates diatonic from non-diatonic notes (open v. filled-in noteheads).

Figure 3.17. Chromatic scale with diatonic/non-diatonic notes differentiated. From p. 1 of sketch material for *Passacaglia ungherese* in the Ligeti Collection at the Paul Sacher Stiftung.



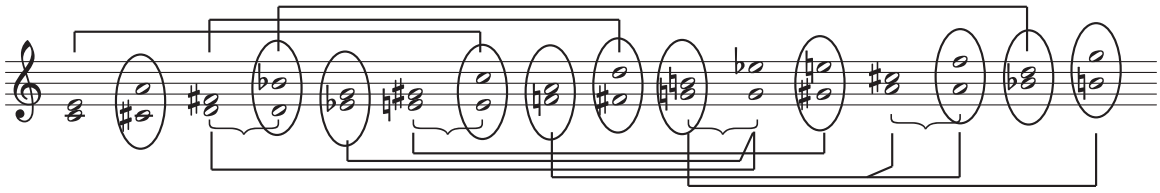
This scale is used to guide the chromatics of the mean-tone temperament in use, as there is a single sharp or flat version for each non-white-key pitch (C-sharp, E-flat, F-sharp, G-sharp, and B-flat). From this scale, Ligeti constructs a succession of the eight major thirds (with these precise spellings of the black-key pitch classes, there are eight major thirds and four diminished fourths), from C ascending to B-flat. He numbers them 1-8 (C/E is 1, D/F-sharp is 2, etc.).

Figure 3.18. The eight major thirds contained in the chromatic scale from figure 3.17—the eight available just-tuned major thirds in quarter-comma mean-tone tuning. From p. 1 of the sketch material for *Passacaglia ungherese*.



There is another schematic chart on this page that pairs up major thirds with their inversions—minor sixths.

Figure 3.19. The major thirds and minor sixths possible above each note of the chromatic scale from figure 3.17—the just tuned major thirds and minor sixths available within quarter-comma mean-tone tuning. From p. 1 of the sketch material for *Passacaglia ungherese*.



Beyond that, the bulk of the remaining sketch material is devoted to experimentation with the ordering of the eight major thirds (or minor sixths) that are to make up the ground.

Along with these charts, there are five different successions of thirds and sixths on this page, with the fifth succession being the one settled on for the movement. They are notated in figure 3.20.

Figure 3.20a. First succession of just-tuned thirds and sixths—candidate for the ground of *Passacaglia ungherese*. From p. 1 of the sketch material.

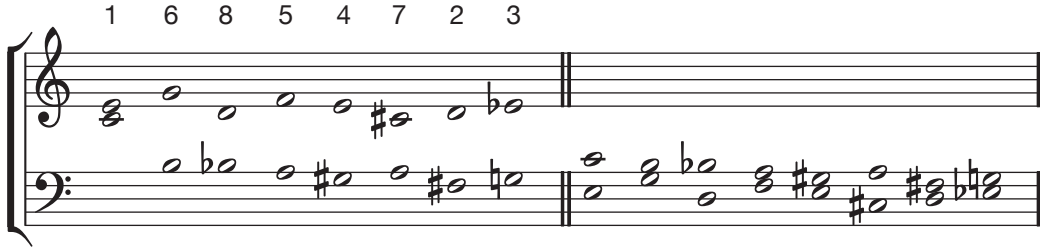


Figure 3.20b. Second succession of just-tuned thirds and sixths—candidate for the ground of *Passacaglia ungherese*. From p. 1 of the sketch material.

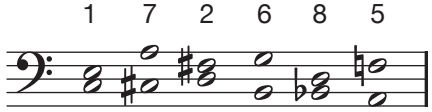


Figure 3.20c. Third succession of just-tuned thirds and sixths—candidate for the ground of *Passacaglia ungherese*. From p. 1 of the sketch material.

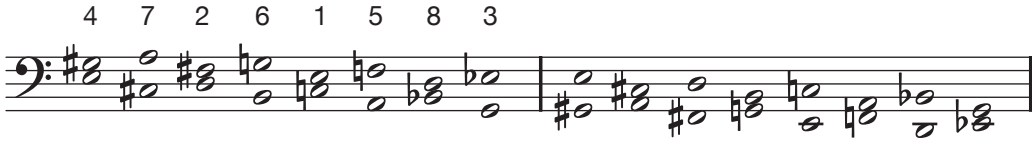


Figure 3.20d. Fourth succession of just-tuned thirds and sixths—candidate for the ground of *Passacaglia ungherese*. From p. 1 of the sketch material. ("x" denotes a chord scribbled out by Ligeti.)

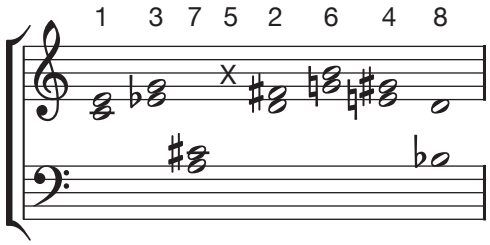
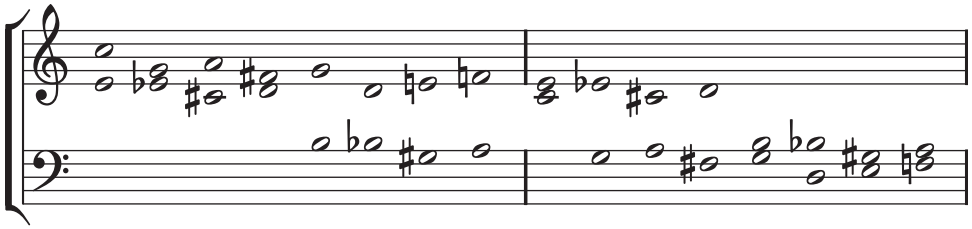


Figure 3.20e. Fifth succession of just-tuned thirds and sixths—chosen ground of *Passacaglia ungherese*. From p. 1 of the sketch material.



Ligeti begins by focusing very much on the contrapuntal lines—especially the bass. The first version of the ground begins with C and descends chromatically down to G-sharp, then it ascends by semitone to A, leaps down to F-sharp (its only non-semitone melodic interval) and back up to G. The second version is similarly chromatic in the bass, but this time beginning with an ascent and then a descent: C–C-sharp–D | B–B-flat–A. (Verticalities form a perfect alternation of thirds and sixths.) The third version is a descending circle-of-fifths progression. As such, it is the only version not to begin on C. Though the bass is no longer chromatic (it is the bass we would expect from a tonal circle-of-fifths progression that alternates root position and first inversion, or in this case third and sixth), the upper line is. In fact, it mimics the pattern of the latter half of the first succession's bass line: G-sharp–A–F-sharp–G, then repeated down a major third.

The fourth version marks a significant change in Ligeti's approach. He no longer focuses on counterpoint, but instead composes a succession entirely of thirds, rather than an alternation of third and sixth, which is unapologetic about its leaps and voice overlaps.

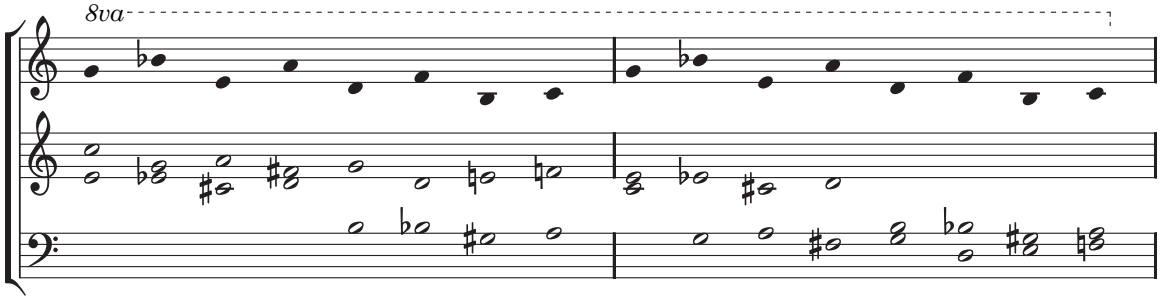
Thus, we might reasonably conclude that he is thinking about harmony here, rather than constituent lines. In the last version, however, he returns to composing good lines, and some of the chromatic elements return to the bass. The E–E-flat–C-sharp–D motive (and its sequential repetition, this time down a fourth) is reminiscent both of the alternating leap and semitone of the circle-of-fifths bass line, as well as the wedge-like shape of the second succession's bass line. And though we have seen diminished thirds between successive chords, this is the first time that such a dissonant melodic interval (especially in mean-tone tuning) appears entirely in the bass line of one of these ground sketches.

As just mentioned, this version incorporates numerous features from previous versions, such as the way its bass line is composed. (Indeed, no version is wholly unique: all but the third begin on C; all but the fourth contain two descending-fifth successions in a row; etc.) But there are other, more harmonic, features that the final version shares with previous versions. The opening three chords—C/E–E-flat/G–A/C-sharp—come from the fourth version. Those three chords are transposed down a fourth to form the fifth through seventh chords. It also contains the A–D–G progression found in both the second and third successions (a short circle-of-fifths sequence). In fact, the following chord in both the second and final successions is also the same—B-flat/D. And lastly, the point at which the final version breaks its sequential repetition of the first half of the succession (between the seventh and eighth chords) is similar to a moment in the first draft of the succession. Instead of following the sequence and progressing down by fifth from E to A (which would repeat a chord), Ligeti progresses up by semitone from E to F (the same interval found at the end of the first succession, which finished with a move from D to E-flat). From these relationships, we can see that as Ligeti experimented with different orderings of the eight intervals of the ground, he found certain progressions that he liked and sought to retain in future versions, and these

are not limited to certain absolute-pitch chord progressions but include relative root-to-root intervals, as well. Thus, the progression of harmonies—in both absolute and abstract space—appears to be an important factor in the preliminary work on this composition.

One last interesting thing to note about this first page of sketches is that once Ligeti settled on a succession of dyads, he composed it out with a third voice; he does so three times. First, over the fifth (and final) ground sketch, Ligeti added a third staff with small, black noteheads. The third voice on this third staff provides the pitches that would make these dyads into triads. But not just any triads, major triads. The bass of each third and the upper voice of each sixth become the root of a major triad.

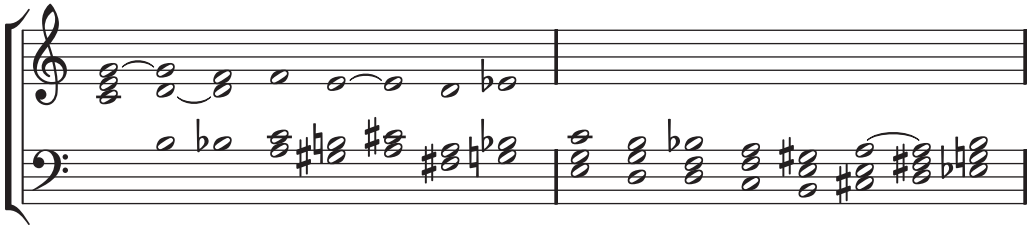
Figure 3.21. Three-voice realization of ground harmonic succession. From p. 1 of the sketch material for *Passacaglia ungherese*.



In a second example, Ligeti puts the chromatic voice of the first ground sketch in the bass and notates this same succession of triads in close position above that bass. In the following bar, he inverts that chain of triads (root-position chords become first-inversion, and first-inversion chords become second-inversion chords). Common tones between successive chords are denoted with a tie. This is probably the best example of abstract harmonic thinking on Ligeti's part. The lines (whose linear and contrapuntal properties were determining factors in their composition) are absorbed into close-position chords—a succession of chords notated as if they were an ear training exercise or a help realization of a figured bass

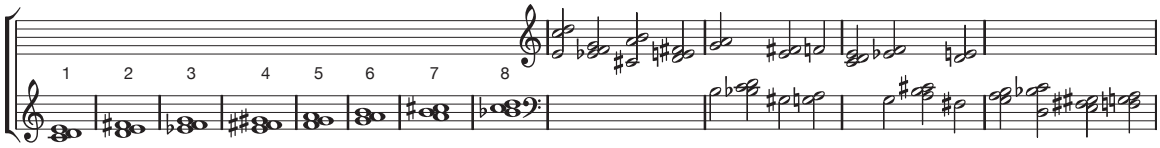
for a modern keyboardist. In other words, there is no consideration of melodic line, only harmonic progression.

Figure 3.22. Three-voice realization of ground harmonic succession—triads. From p. 1 of the sketch material for *Passacaglia ungherese*.



Lastly, there is a third composing-out of the dyad succession. Ligeti transforms the (04) dyads into (024) trichords, rather than (047) triads. This texture never ends up in the final piece, but it is interesting that after composing these thirds out as major chords, he composes them out as non-tertian chords (and then follows with the same simple invertible-counterpoint treatment). It is also interesting that though Ligeti composes these thirds out as (024) trichords and as *major* tertian chords, he never composes them out as *minor* chords in the sketches (though he does at times during the final work).

Figure 3.23. Three-voice realization of ground harmonic succession—024 trichords. From p. 1 of the sketch material for *Passacaglia ungherese*.



Once Ligeti has pinned down the ground and performed these brief experiments regarding its composing-out in multiple voices, there is no sketch work done for the melodic line. In his complete draft of the movement, which follows in the *Skizzen* packet, there are about a dozen bars discarded that were rewritten (sometimes similar to, sometimes rather different from, the final version). But it seems as if once the ground was settled, the piece was

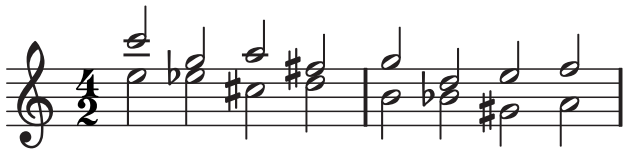
composed rather quickly (like *Hungarian Rock*), and that the work in determining the structure and ordering of the ground was the major precompositional work.

From these observations of Ligeti's sketch material for this work, we can conclude two very important things about Ligeti's composing of the *Passacaglia ungherese* in light of the present study of harmonic progression in Ligeti's triadic pieces. First, Ligeti was thinking about *harmony* from the beginning: he wrote the piece in mean-tone, focused on the harmonic intervals that are tuned justly in that tuning system, and conceived of the intervals as incomplete major triads that function in abstract space independent of line. Second, Ligeti was thinking about *harmonic progression* from the beginning and throughout the precompositional planning: he focused his attention primarily on the ordering of the just thirds and sixths he chose for the basis of the ground (and the triads they represent).

THE PERCEPTION OF DISSONANCE IN A CYCLE OF CONSONANCES

This ordering of the just thirds and sixths in the ground of *Passacaglia ungherese* generates an interesting psychoacoustic effect. Consider mm. 3–4 (the first time that the two lines of the invertible ground are played together).

Figure 3.24. Mm. 3–4 of *Passacaglia ungherese*.



I have played this passage for several dozen colleagues, students, and friends of varying musical background—most of whom had not heard the piece before—and asked whether the

passage contains all consonant chords, all dissonant chords, or some consonant and some dissonant chords. Over 90% of them claimed to have heard some consonant dyads and some dissonant dyads, with only a handful responding that they heard all consonant dyads. (None reported hearing all dissonant dyads.) Of course, as we've already remarked, these eight chords are all major thirds or minor sixths—consonant intervals—but to most people, some sound dissonant and some consonant. Why is this the case? How is it that this passage is comprised of justly tuned consonant dyads, and yet listeners tend to hear it as containing dissonant intervals?

Ian Quinn (the advisor to this dissertation) and I conducted a small, informal experiment that gathered data about how listeners perceive consonance in this succession of dyads. While the results cannot form a sound basis for any conclusions about the perception of consonance and dissonance, these results do raise interesting questions that we hope to use as the basis of a future experiment on the perception of consonance. These results also reveal an interesting trait of the harmonic structures of this movement.

The experiment was conducted as follows. We recorded two versions of mm. 3–4 on a harpsichord in the Yale University Department of Music. One version was performed immediately after the harpsichord had been tuned to equal temperament, and the other was performed immediately after the same harpsichord had been tuned to quarter-comma mean-tone temperament (with Ligeti's stipulated chromatics). The recordings were then played for Quinn's music cognition (MUSI 343) students on separate days (46 students on the first day, equal temperament; 44 students two days later, mean-tone). These students exhibit a wide variety of musical training and background—from none to pre-professional—but were all in the final week of a semester-long course on music cognition. The class was divided roughly in half according to birthdate to form two sampling groups. The entire class was played the

excerpt of the day three times, with a brief break between hearings, and were provided with a sheet of paper with eight numbered blanks, one for each dyad in the succession. The first sampling group was instructed to write a "C" in the blank if the chord sounded consonant, and to write nothing if the chord did not sound consonant. The second sampling group was instructed to write nothing if the chord sounded consonant, and to write an "N" in the blank if the chord did not sound consonant. (We did not use the term *dissonant*, and we left the students to their own understanding of the term *consonant*.)

On the first day (equal temperament), 7 of 46 students reported hearing all as consonant (3 of 19 in the C/blank sampling group, 4 of 27 in the blank/N sampling group), none reported hearing none as consonant, and the remaining 39 students reported some of each. On the second day (mean-tone temperament, and it is important to keep in mind that though 48 hours had passed, they had heard the excerpt before in equal temperament), 9 out of 44 students reported hearing all as consonant (6 of 23 in the C/blank group, 3 of 21 in the blank/N group), none reported hearing none as consonant, and the remaining 35 students reported some of each. Though there is some difference here (15% heard all consonant in equal temperament, 20% in mean-tone), these were single tests with too few subjects to divide randomly into enough sample groups to obtain standard deviation measures, and thus there is no 95%-confidence rating. Combined with the fact that the excerpt was familiar *and* in a different tuning system on the second day, it is impossible to claim either that there is an effect in the percentage of students hearing all dyads as consonant or that the effect is caused by the difference in tuning system. However, it is interesting to note right off the bat that 85% on day one and 80% on day two perceived dyads that are consonant by any modern metric as *not consonant*.

Following are the specific results for both tests. Values are the percentage of subjects reporting "C" or not-"N" for the dyad in question.

Table 3.1. Data from consonance-perception experiment using the first eight dyads of the ground of the Passacaglia ungherese—equal temperament.

	Dyad 1	Dyad 2	Dyad 3	Dyad 4	Dyad 5	Dyad 6	Dyad 7	Dyad 8	Average
C	78	42	52	89	78	42	36	57	59.250
not N	88	44	51	85	96	48	51	66	66.125
average	83	43	51.5	87	87	45	43.5	61.5	

Table 3.2. Data from consonance-perception experiment using the first eight dyads of the ground of the Passacaglia ungherese—quarter-comma mean-tone.

	Dyad 1	Dyad 2	Dyad 3	Dyad 4	Dyad 5	Dyad 6	Dyad 7	Dyad 8	Average
C	82	56	56	95	86	60	43	73	68.875
not N	90	42	57	85	85	33	28	61	60.125
average	86	49	56.5	90	85.5	46.5	35.5	67	

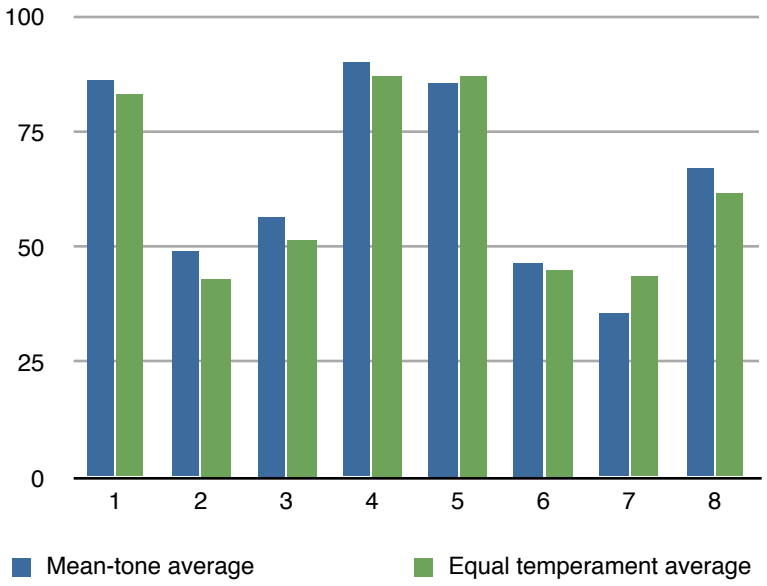


Figure 3.25. Percentage of subjects reporting dyads as consonant or not not-consonant (i.e., dyads left unlabeled by subjects in the blank/N group).

Again, due to the nature of the test, there are no 95%-confidence ratings, and we can draw no definitive conclusions from this data. However, this data presents some interesting findings, however preliminary or tentative. First, we can notice a degree of uncertainty in the

first day (equal temperament) followed by an over-certainty in the second day (mean-tone). That is, on the first day, 59% of the blanks for the C/blank group were marked "C," while 34% of the blanks for the blank/N group were marked "N." This means that 46.5% of the blanks were marked, when we would expect 50% (since each group would be the inverse of the other in a binary, either/or situation). Thus, on the first day there was a no-man's land in the data, or a degree of uncertainty, where on average, some chords were interpreted one way, some chords the other, and some, abstractly speaking, left uninterpreted. The opposite happened on the second day. 69% of the blanks for the C/blank group were marked "C," while 40% of the blanks for the blank/N group were marked "N." This means that 55% of the blanks were marked, noticeably more than on day one. There are three possible interpretations of this data, none of which we can rule out: 1) the difference is insignificant, and there is no effect; 2) the difference is an effect due to the difference in tuning system; or 3) the difference is an effect of a difference in familiarity from day one to day two. We unfortunately cannot do anything more than speculate about a possible effect, without further testing.

We can also note a high degree of consistency between the two tests. The percentage of subjects interpreting each chord as consonant (or not not-consonant) varies little between the two tests, and thus probably between the two tuning systems. (I say "probably" because there may be an effect of memory—subjects remembering their appraisal from the first test when taking the second—and a desire from the subjects to be consistent from test to test.) There is a wider range of values for each chord in mean-tone than in equal temperament. However, the difference is not large, and this—like the under-certainty/over-certainty "effect"—may be an effect of increased familiarity on the second test (mean-tone) rather than an effect of the properties of the tuning system.

The eight dyads can potentially be grouped into categories of *consonant* and *not-consonant* intervals within the context of this intervallic ordering, and pursuing such a categorization reveals the most interesting property of this succession of harmonies. From looking at the graph or data tables (see tables 3.1 and 3.2 and figure 3.25 above), it is fairly clear that chords 1 (no preceding context in the experiment), 4, and 5 (both following descending-fifth root motion) are the most consonant dyads—or the most likely to be reported as consonant. It is also clear that we can group together chords 2, 3, 6, and 7 as the least (likely) consonant dyads (these follow root motion by 3 or 6 steps on the circle of fifths). The question is what to do with chord 8. In both tunings systems, it is clearly closer to the not-consonant group than to the consonant group. But we can still consider two possibilities: grouping chord 8 with the not-consonant dyads, or segmenting it off on its own as a moderately (likely to be perceived as) consonant chord. I think it is warranted to consider both as possibilities when considering potential analytical insights from this experiment. It is warranted to consider chord 8 part of the not-consonant group because its value is so close to the values of chords 2, 3, 6, and 7. It is also warranted to consider it as distinct because there is such a strong contrast between chords 7 and 8. This means that, on average, subjects hear a more distinct difference in the degree of consonance between chords 7 and 8 than between other adjacent members of the not-consonant group (i.e., chords 2 and 3, chords 6 and 7).

Summing up, we can draw the following points—with qualification—from the data. First, there is no discernible effect of tuning system on the consonant/not-consonant appraisals in this experiment. Second, chords 1, 4, and 5 can easily be interpreted as belonging to the set of *consonant dyads*. Third, chords 2, 3, 6, and 7 can easily be interpreted as belonging to the set of *not-consonant dyads*. And finally, chord 8 is not likely a *consonant dyad*; chord 8 may be interpreted as a *not-consonant dyad* or on its own as a *moderately consonant dyad*. Why

this stratification? What properties do dyads 1, 4, and 5 share that the others do not that make them more likely to be perceived as consonant when all eight dyads are tuned the same?

In an experiment testing the effects of harmonic priming on specific tasks of musical perception, Jamshed Bharucha & Keiko Stoeckig (1986) found what could be an answer to this question. In somewhat of a by-product to their primary research, they found that when a target chord immediately follows a priming chord, the harmonic relatedness of the two chords influences an in-tune/out-of-tune appraisal of the second chord. Specifically, if the two chords are closely related (i.e., if they can be found in the same key and/or are fewer steps apart on the circle of fifths), the likelihood that the target chord is appraised as in-tune increases; if the two chords are distantly related (i.e., if they cannot be found in the same key and/or are further apart on the circle of fifths), the likelihood that the target chord is appraised as out-of-tune increases. Thus, they find chord progressions where subjects frequently assess an out-of-tune chord as in-tune because it is strongly related to the preceding priming chord, and progressions where subjects frequently assess an in-tune chord as out-of-tune because it is not strongly related to the preceding priming chord. The authors interpret this result as the harmonic expectancy of the target chord, based on its context, influencing its perceived consonance. (The authors unapologetically equate *in-tune* with *consonant* and *stable*, *out-of-tune* with *dissonant* and *unstable*.)

This study can explain the perception of some of the chords in the ground of Ligeti's *Passacaglia* as consonant and others as not-consonant, though they are acoustically identical. The two distantly related chords in their study that are more likely perceived as dissonant are major chords whose roots are separated by a tritone. This is the same root motion between dyads 2 and 3 and dyads 6 and 7, potentially explaining the common not-consonant

perception of chords 3 and 7 in our experiment. The two closely-related chords in their study that are more likely perceived as in-tune (even when they are out-of-tune) are major chords whose roots are separated by a perfect fifth. This is the same root motion between dyads 3 and 4 and dyads 4 and 5, potentially explaining the common consonant perception of chords 4 and 5 in our experiment.

From the perspective of Ligeti's *Passacaglia ungherese*, there are some lingering questions following Bharucha and Stoeckig's study (the role, if any, of acoustic roughness perceived in echoic memory and the validity of mapping in-tune/out-of-tune onto consonant/dissonant, for example). However, this study is one of a number of music cognition studies and music theory treatises that articulate a specific aspect of a more general principle: changes from one chord to another sound smoother when the chords are expected, or closely related; likewise, the more closely related two successive chords are, or the more expected the second of those two chords is, the more likely the second chord is to be perceived as stable, in-tune, or consonant (all else being equal). (See Krumhansl 1990, ch. 8, for a detailed discussion of much of the foundational work in music cognition on this issue. See also, Bigand et al., 1996; Regnault et al., 2001; and Schön et al., 2005.)

In the case of Ligeti's ground, we can apply this principle and see rather easily why chords 1, 4, and 5 form the set of the most (likely) consonant chords; 2, 3, 6, and 7 the least (likely) consonant; and 8 possibly a member of the latter group or possibly forming its own mid-range consonance level. Chord 1 has no preceding context in this experiment, and thus is most likely appraised simply on acoustical grounds, rendering it a likely consonance. Chords 4 and 5 are closely related to their immediately preceding chords. That is, chords 3 and 4, and chords 4 and 5, can be reckoned as belonging to the same diatonic collection; likewise, their roots—when the invertible counterpoint is conflated to a succession of major

thirds, or when considered incomplete major triads as seen in Ligeti's sketch (figure 3.21)—are a single step away on the circle of fifths. By these two common measures of harmonic distance (and Bharucha & Stoeckig's results), we can see why these chords would form the most (likely) consonant group.

The not-consonant group is also easily seen by these two common measures of harmonic distance. None of chords 2, 3, 6, 7, or 8 can be reckoned as belonging to the same diatonic collection as the immediately preceding chord. Likewise, they are all relatively distant moves on the circle of fifths: chords 2 and 6 are three steps from the preceding chord, chords 3 and 7 six steps (the furthest move possible), and chord 8 five steps.

And though chord 8 can easily be interpreted as belonging to the not-consonant group by these measures, we can also easily see why it would occupy a mid-point of (likely) consonance in this succession. Though it is distant from the preceding chord on the circle of fifths and cannot be reckoned in the same *diatonic* collection as chord 7, chords 7 and 8 can be reckoned in the same *harmonic minor scale*. In fact, if chord 7 (E/G-sharp) is an incomplete E-major triad, and if chord 8 (F/A) is an incomplete F-major triad, then the move from chord 7 to 8 is a fairly common one: a deceptive cadence, dominant-to-submediant, in the key of A minor. Thus, though chords 7 and 8 are not closely related by standard measures, they can easily be interpreted as the incomplete voicing of a relatively common chord progression; in other words, chord 8 is more likely in tonal-harmonic music to follow its immediately preceding chord—it is more *expected*—than chords 2, 3, 6, or 7.

It is worth reiterating that the results from this experiment are more-or-less consistent between mean-tone tuning and equal temperament. That is, they are not a product of the unusual (in 1978) tuning system and the wolf *melodic* intervals present in the ground, for example. They are a product of the knowledge of the tonal-harmonic system possessed by

our subjects (and by Bharucha and Stoeckig's), and they demonstrate the influence of that knowledge on musical perception even outside the domain of tonal-harmonic music. These consonant dyads, and the triads they often form with pitches in the melody, are not perceived as "isolated" chords in an atonal context; they are perceived as chords with a syntactic context and a tonal history. And whether or not Ligeti was aware of the specific kinds of effects discussed in these last few pages, it is clear from his sketches that Ligeti took great care in working out the order in which these eight justly tuned chords are heard in this movement. Further, Ligeti makes use of the difference between these contextually "consonant" and contextually "not-consonant" ic4 ground dyads—and the varying tonal (circle-of-fifths) distances between successive dyads that generates that perception—in some specific ways in the form of the movement.

ACOUSTIC AND CONTEXTUAL "CONSONANCE"; SYNTAX AND FORM

This effect of context on the perception of consonance plays a key role in the harmonic and formal structures of *Passacaglia ungherese*. However, it does not do so alone. Ligeti also plays very strongly on the acoustic consonance and dissonance of the sonorities he employs as a melodic strain is added to the recurring ground succession of chords. As we will see shortly, this interaction of acoustic and contextual "consonance" and "dissonance"—in conjunction with registral, durational, and gestural melodic traits—articulates a large-scale formal structure that contains an elaborate system of expectation generation, fulfillment, and denial that is dependent on listeners' implicit knowledge of tonal-harmonic syntax. This discourse with, and play on, listener knowledge and pre-existing expectations can be seen primarily in Ligeti's treatment of outer-voice harmonic dissonances, his preparation for the final "cadence" of the piece, and the relative harmonic stability of major "cadential" arrivals

and other key melodic moments in the form. In what follows, I will discuss Ligeti's use of acoustic consonance and dissonance to create impressions of tension and resolution—stability and instability—on the chord-to-chord level, his use of contextual consonance and dissonance to do the same, and the large-scale formal structure that results from the employment of these constructions throughout the work.

Acoustic consonance and dissonance in outer-voice intervallic patterns

Let me begin with a discussion of some general patterns seen in Ligeti's employment of acoustic consonance and dissonance. Ligeti incorporates a proportion and distribution of (acoustically) consonant and dissonant intervals between outer voices reminiscent of baroque music, but a more diverse way of treating these dissonances locally. Like, for example, a typical Bach chorale, there are a fair number of dissonances (fourths, sevenths, ninths, and augmented and diminished intervals), but most outer voice intervals are consonant (thirds, fifths, sixths, and octaves). Similarly, most of Ligeti's dissonant outer-voice intervals are followed by an outer-voice consonance. The result is a consonance-dissonance—or tension-resolution—profile that sounds very similar to a number of baroque works. However, the treatment of each of these dissonances on the local scale exhibits a greater diversity of treatment in Ligeti's passacaglia than we would expect to find in a baroque work.

This diversity works itself out in a few ways. First, in a tonal system, specific dissonances generate expectations not only for a consonant interval to follow, but for a specific consonance (or a small set of specific possible consonances) to follow. Generally speaking, a diminished fifth in a tonal work generates a strong expectation that the following interval will be a third with its lower voice a semitone higher than the lower voice of the fifth; an augmented fourth, conversely, generates the expectation that a sixth with its upper voice a semitone higher than that of the fourth will follow. Seconds and sevenths are, generally

speaking, a bit more free in that the lower voice of the second or the upper voice of the seventh is expected to descend by step into a consonance, but a greater number of intervals between that resolution tone and its harmonic counterpart are acceptable.

Sometimes Ligeti fulfills these specific types of tonal expectations, and the result is a strong projection of traditional tonal resolution. For example, the contrapuntal motion into the downbeat of m. 26 (which is replicated several times in this work) projects a strong tonal progression: a minor sixth moves to a diminished fifth over the same bass, and the two tones of the diminished fifth move in by semitone to a major third. This progression makes use of the descending-fifth root motion between the roots of the successive major thirds in the ground between the fourth and fifth dyads (D to G); successive iterations of this motive (seen below) make use of this descending fifth and that found between dyads three and four (A to D). The result in each of these occurrences is a very clear V^{8-7}–I progression, either in G major or D major. (Note that in m. 38, the tonic of G is elided for a dominant seventh in C, which does *not* receive its typical tonal resolution). There is no mistaking the functional tonality in these progressions, even if the projected tonic does not hold for long.

Figure 3.26a. Dominant-tonic progression in mm. 25–26.

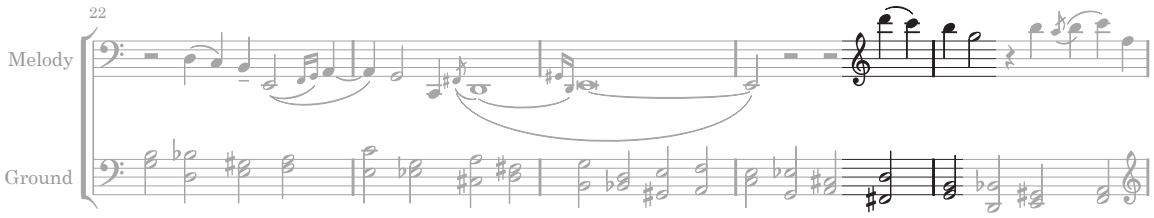


Figure 3.26b. Dominant-tonic progressions in mm. 31 & 34.

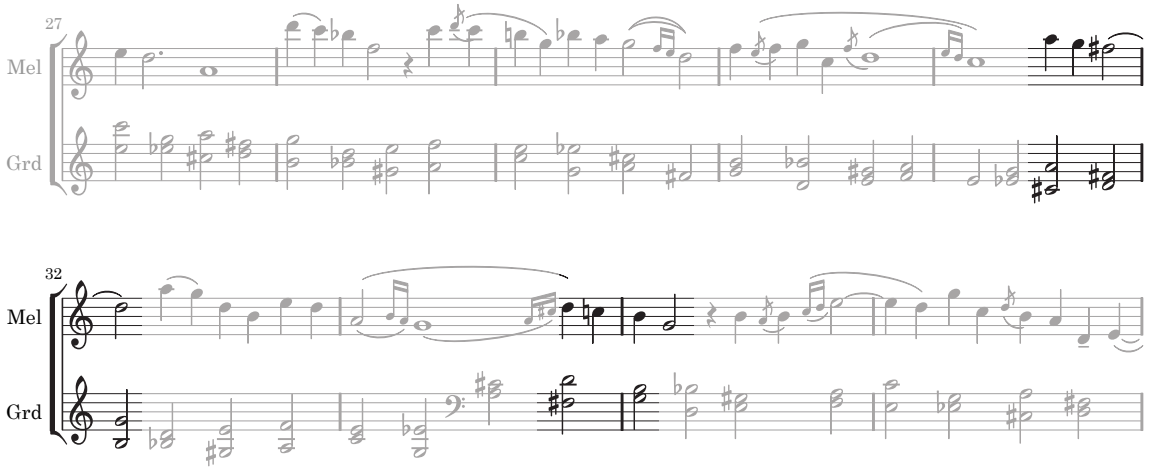
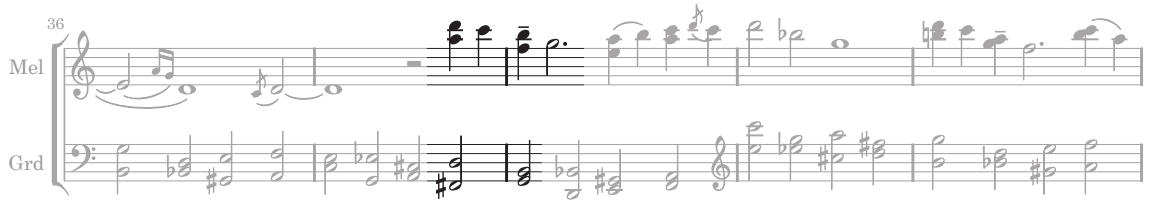
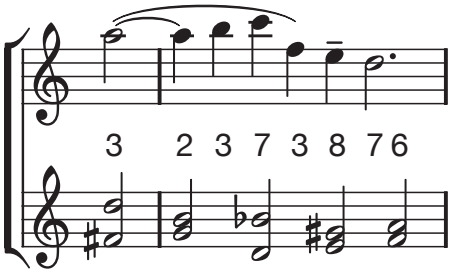


Figure 3.26c. Dominant-tonic progression in m. 38.



In passages like m. 6ff. (the entrance of the melody), for example, something different is at work. There are three dissonant outer-voice intervals in m. 6, all of which are followed by consonances. However, each of them works against the expected norms of tonal progression.

Figure 3.27. M. 6, outer-voice counterpoint.

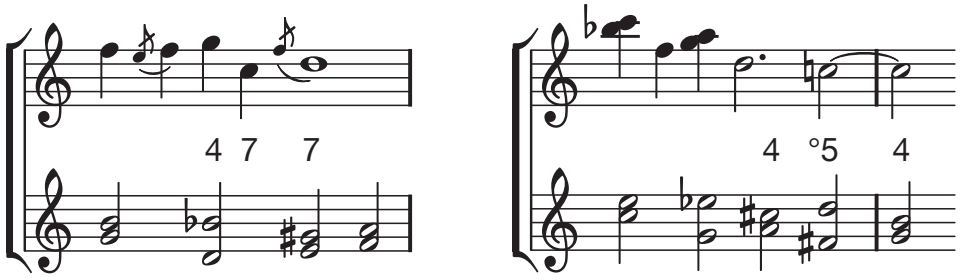


First, the upper note of the ninth between the outer voices on the downbeat resolves *up* to a tenth, rather than down to an octave, as we might expect. Second, the upper note of the seventh on the second half-note beat *leaps* down to a third, rather than moving by step. Finally, the seventh on the weak part of the third half-note beat resolves by step into a sixth, a common enough contrapuntal phenomenon. However, Ligeti's *7*-6 motion breaks a number of conventions. The *7*-6 resolution in diatonic contrapuntal writing is typically a suspension figure: the upper voice seventh occurs on the strong part of the beat and resolves down by step to a sixth on the weak part of the beat over a single bass note (or harmony). Conversely, an *essential* seventh dissonance (to use Kirnberger's term) occupies the weak part of a beat or the entire beat and resolves down by step to a consonance on the strong part of the subsequent beat over a change in bass (or harmony). Since both voices change in the latter motion, the essential seventh cannot be followed by a sixth. However, Ligeti's resolution happens over a change of harmony from weak to strong parts of successive beats, like an essential seventh; it resolves to a sixth, like a suspended seventh; and the upper voice sustains while the bass (and middle) voice moves, like neither seventh. This seventh does not conform to traditional tonal or contrapuntal norms, nor can it be considered a kind of hybrid between the two traditional seventh treatments. Instead, it—along with the two previous dissonances—provide the dissonance-consonance profile expected from a tonal or pre-tonal work, but without fulfilling all of the specific contrapuntal expectations that traditionally accompany that profile.

In addition to passages like m. 6, there are a number of places in this piece where even the general pattern of dissonance followed by consonance is denied. This can be seen in passages like m. 30, where a fourth on the second beat "resolves" into a seventh, which moves in parallel up into another seventh. Similarly, mm. 41–42 present an outer-voice

fourth on the third beat. The upper voice proceeds down by step, but not into a third; instead, the leap in the bass voice creates a diminished fifth. Again, one voice moves as expected: the bass moves up by semitone; however, the upper voice is tied over, generating another fourth, leaving it with three dissonances in succession: fourth–diminished fifth–fourth.

Figure 3.28. M. 30 & mm. 41–42, outer-voice counterpoint.



Finally, within some phrases where dissonances are generally placed between two consonances, Ligeti works against the dissonance-resolving-to-consonance pattern by ending the phrase with a dissonance between the outer voices. In such phrases, the *alternation* of consonance and dissonance is largely preserved, but the idea of *resolution* is called into question. Examples include the melodic phrases that end in mm. 14, 34, 49, etc.

This diversity of dissonance treatment in the *Passacaglia ungherese* interacts with some elements of tonal syntax to generate a rather elaborate system of expectancy-fulfillment/denial relative to both tonal and atonal musics. On the small scale, this primarily widens the possibilities of interval progression (relative to tonal music) without wholesale removal of that expectation system (in contrast to the atonal music of Schoenberg and his students). When dissonances are followed by dissonances—especially when there also is not clear linear progression to mitigate the unexpected harmonic motion—there is a higher degree of tension than in most atonal music because such progression violates our expecta-

tions from tonal practice and from the general treatment of dissonance in this work. When dissonances are followed by consonances other than those specific consonances expected in a tonal system, both fulfillment and denial of expectation are present simultaneously. And in those rare moments when Ligeti provides the precise intervallic progression one would expect in a tonal context, both the satisfaction of its occurrence and the tension resulting from the rapid departure to a new tonal universe and diatonic collection (necessitated by the ground) are heightened. Such phenomena are difficult to obtain in sound worlds more wholly tonal or atonal. Further, this diversity of dissonance treatment and the resulting effects on the perception of stability and instability create a potential syntactic system that is at once idiosyncratic and based in widespread knowledge of traditional structures, and Ligeti makes use of that syntactic potential in his construction of a large-scale form.

This is the case on the phrase level and in the incorporation of major melodic cadence points. First, we can see Ligeti using acoustic consonance as the primary means of beginning and ending melodic phrases. If we divide the melody into small units,[8] all of these units begin with a consonant chord between the melody and ground, and almost all of them end with a consonant chord between melody and ground. Thus, there seems a clear use of acoustic consonance as a stable sonority capable of assuming the functions of initiation and arrival on the phrase level.

More interesting is the use of acoustic consonance and dissonance in the articulation of large-scale form. As outlined above, there are three primary points of melodic cadence in this piece: mm. 25, 49, and 74—dividing the piece almost exactly into thirds—with secondary cadence points at mm. 14, 37, and 55. The final cadence of the movement possesses properties

[8] For the first of the three main divisions of the piece, I see these units as those ending at m. 6, beat 4; m. 7, beat 4; m. 8, beat 3; m. 10, beat 1; m. 11, beat 1; m. 14, beat 1; m. 21, beat 1; and m. 25, beat 1. For the second division, m. 27, beat 4; m. 28, beat 3; m. 31, beat 2; m. 36, beat 2; and m. 49, beat 2. For the third division, m. 51, beat 1; m 52, beat 3; m. 55, beat 2; and the end of the movement.

common to tonal music that ascribe it a strong terminating function, and the properties of the others and the patterning of their occurrence contribute to a teleological progression toward the terminal cadence.

Setting aside the rather obvious registral and durational patterns that signal the end of the movement, let's examine the consonance and dissonance usage of the final four bars, as Ligeti prepares the final cadence. In general, the quarter- and half-note textures in this movement involve noticeably more outer-voice consonances than dissonances (recall that the half-note rhythm of the ground was taken as the rhythmic pace of the harmonic reduction used for Chapter 2's statistical analysis). However, the last four bars present a marked shift from that property. Of the 27 different vertical sonorities in the final four bars, only ten involve outer-voice consonances (two of which involve rests in the melody, and thus only comprise the consonant sixth of the ground), and when all voices are considered, only nine vertical sonorities (one-third) are acoustical consonances. The final sonority, however, is a consonant E-major triad. The increase in dissonances approaching this cadence seem to prepare a space for that consonant triad as well as increase the potential satisfaction of its arrival, in strong contrast to what immediately precedes it. Further, the final sonority is a root-position triad, but all of the other consonances of the last four bars are either dyads, doubled dyads, or inverted triads. Even the consonances, then, are preparing a potential sense of resolution by contrast. Combined with the registral descent and the written-out deceleration (and the fact that this is the only place where the ground and melody coincide in terminating their downward progressions), these elements together project a strong point of termination.

The relationship between the final cadence and the previous melodic cadences also prepares this final cadence. The first primary cadence (mm. 24–25) accompanies the final me-

lodic note (E2) with an intervallic progression of fifth–diminished fifth–third–fourth–sixth (consonance–dissonance–consonance–dissonance–consonance). The first consonance is an E-minor triad, the second a doubled dyad suggesting E major (E, E, G-sharp), the last a doubled dyad suggesting C major (C, E, E). In sum, this cadence ends on a melodic E, with the note articulated and concluded with consonances, and with a strong emphasis on E and C as potential important structural pitches.

The second primary cadence (mm. 48–49) accompanies the final melodic note (C4) with an intervallic progression of diminished fourth–third–octave–fourth (dissonance–consonance–consonance–dissonance). The first dissonance is an inverted C-augmented triad, the first consonance an inverted F-major triad, the second consonance a doubled dyad suggesting C major (C, C, E), and the final dissonance a second-inversion C-minor triad. In sum, this cadence ends on a melodic C, with the note articulated and concluded with dissonances, and with a strong emphasis on C as a structural pitch.

The final cadence accompanies the final melodic note (E4) with an intervallic progression of sixth–ninth–octave (consonance–dissonance–consonance; leaving off the tie into the last bar). The consonances are, first, an inverted E-minor triad and, second, a root-position E-major triad. In sum, it ends on a melodic E, with the first and last accompanying sonorities as consonances, and with a strong emphasis on E as a structural pitch.

The first cadence sets a pattern—consonance–dissonance–consonance—that is contrasted in the second and recaptured in the final. The first cadence poses a question regarding structural pitch teleology: is C or E the primary structural pitch, and which one—if either—will function as the closing structural pitch-class of the movement? The second cadence provides an unsatisfactory (dissonant) conclusion on C; the final provides a satisfactory (consonant) conclusion on E.

This use of acoustic consonance and dissonance for this structural pattern allows Ligeti to retain the consonance–dissonance–consonance structure *and* progress from a single opening pitch (C) through a tonal question (C or E?) to a final resting place different from the start (E). Interestingly, both of these large-scale structures are more readily audible to listeners than traditional tonal structures. In traditional tonal forms, such as sonata or ternary forms, there is typically a stability–tension–stability or home–departure–return pattern in the large scale tonal scheme, but this pattern is generated through modulation. In a major-key movement, this typically involves the key of the dominant (also major) controlling a large portion of the middle of the movement before returning to the home key. The harmonic or tonal tension created by this modulation is often referred to as "structural dissonance" (see Rosen 1988, p. 25), meaning that there is a tonal conceptual dissonance between the home key—which in common-practice tonal music is also the tonal *goal* of the movement—and this subordinate or secondary key. This structural tension is resolved in sonata form, for example, by recapitulating the "secondary" thematic material (originally presented in the key of the dominant) in the home key. This tension is not easily heard by all listeners; one must be familiar with the standard practices and have a keen enough ear to hear the difference in key of the different themes or large sections of the form. Ligeti's harmonic structure in the *Passacaglia ungherese* projects the same kind of large-scale stability–tension–stability pattern, but he incorporates *acoustical* dissonance, rather than merely *structural* dissonance, which means that listeners with no pre-existing knowledge of the form, nor any particular aural prowess, can more readily detect the tension in the second major cadence and the contrast between it and the final cadence.

Further, even the move from C to E over the entire length of the piece can be more readily perceived than many large-scale harmonic shifts in common-practice tonal music

because the constantly recurring eight-chord ground ties pitch content to metric placement. To detect that the opening and closing harmonic sonorities are not identical, a listener need not possess absolute pitch, but simply need notice that the piece ends on the seventh chord of the eight-chord pattern rather than cycling back to the first. Thus, the way in which Ligeti employs consonance and dissonance in the cadential patterns of this piece allow him to generate salient long-range expectancies, and it allows these expectancies to be perceived more readily than large-scale procedures in typical common-practice tonal music, enhancing his ability to interact with listeners' expectations.

Contextual consonance and dissonance and the articulation of formal structures

The varying degrees of contextual consonance observed in the above informal cognition experiment are helpful, alongside traditional categories of acoustic consonance and dissonance, in analyzing the way Ligeti makes use of traditional syntactic implications in his construction of a large-scale form. We can see this most starkly in the metric placement of the beginnings and ends of the large-scale formal sections noted above, as the metric placement of those melodic entries and cadences ties them to particular harmonic sonorities, which can be divided into at least two discrete categories of stability and instability. (We can also see this in smaller-scale structures, as well, but I will focus on the larger-scale divisions for this analysis.)

The movement's melodic strain, as described above, can be divided into three large divisions: mm. 5–25, mm. 25–49, and mm. 49–74. We can further divide these three large sections each into two halves: mm. 5–14, mm. 14–25; mm. 25–37, mm. 37–49; mm. 49–55, and mm. 55–74. Following are the starting and ending points of each of these six divisions, labeled according to the dyad of the ground over which they occur. In the case of cadence points, both the point of articulation and the last ground dyad with which the melodic note sounds are

given. (Dyads are numbered 1–8 beginning with the C/E dyad and ending with the F/A dyad.)

Table 3.3. Metric placement of the beginning and cadence of each of the six primary divisions of the melody of *Passacaglia ungherese*, labeled according to the co-articulated ground dyad (C/E = 1, . . ., F/A = 8).

Bars	Beginning dyad	Ending dyad (articulation)	Ending dyad (release)
5–14	4	3	5
14–25	7	5	1
25–37	4	8	2
37–49	4	7	2
49–55	4	1	2
55–74	4	4.5	7

The first striking thing about this table is the fact that every melodic division except for the second begins on the fourth dyad of the ground (D/F-sharp). This is one of the three contextually consonant dyads of the ground—along with the first and fifth dyads. It seems, then, that Ligeti generally uses these contextually consonant dyads—or at least this fourth dyad—as a stable point of departure for the large melodic divisions of the piece. We can also see this on the smaller scale in the second large division of the movement (mm. 25–49), as the prominent V^{8-7}–I melodic motive that happens frequently in that section always occurs over dyads 3 and 4 or 4 and 5, and it is a gesture of melodic phrase initiation.

There is a greater variety in the way that Ligeti ends these large divisions—i.e., in his melodic cadences. However, there is a pattern in the way that Ligeti ends the three large divisions. First, the cadence in mm. 24–25 occurs over points of contextual consonance. The final melodic note—sounded on the downbeat of m. 24—is articulated over a contextually consonant dyad, and terminates over a different contextually consonant dyad. The cadence in mm. 48–49, by contrast, is articulated and terminated over contextually dissonant dyads. The final cadence demonstrates further contrast. The final melodic sonority is a dyad, rather than a single note, but the notes are articulated successively rather than simultaneously. The

first note (B, m. 73) occurs over a contextually dissonant dyad. The second note (E, m. 73) occurs on a weak quarter-note part of the beat, over a contextually consonant dyad, but not co-articulated with that dyad. These notes terminate the movement over the final E/G-sharp dyad—contextually dissonant, and the same dyad over which the second of the three major cadence notes was sounded (m. 48).

This complex final cadence is best sorted out alongside the above analysis in terms of its acoustic consonance and dissonance. Both the B and E enter forming acoustic dissonances with the ground notes underneath. In the case of the E, this is in contrast to the contextual consonance of the accompanying D/F-sharp dyad. The B and E terminate as acoustic consonances with the ground dyad E/G-sharp, which is one of the contextually dissonant dyads of the ground. Thus, at both the point the final melodic note—E—is articulated and the point it is terminated, the acoustic and contextual stabilities are in conflict: by one property, the chord is consonant or stable, and by the other it is dissonant or unstable.

By contrast, the melodic cadential note of m. 24 arrives at a point of both acoustic and contextual consonance, and the melodic cadential note of m. 48 arrives at a point of both acoustic and contextual dissonance. According to the formal analysis above of the consonance–dissonance–consonance pattern, we would expect the final cadence to involve both acoustic and contextual consonance. It does. However, those two properties never come simultaneously, and the contextual consonance of the D/F-sharp dyad can easily be overshadowed by the acoustic dissonance of the full chord at the end of m. 73. Likewise, the acoustic consonance of the final E-major chord is mitigated by the diagonal tritone between the tenor voice of the penultimate chord (B-flat) and the bass of the final chord (E)—the "roots" of the major-third ground dyads. (Perhaps this—along with its weak metric position and its ending

on the seventh note of the eight-note ground—is why, to my ears, the E/G-sharp dyad needs to ring a second or two before I hear it as stable and ultimate.)

The consistency between these two criteria of stability and instability at the earlier primary moments of melodic cadence, and then the conflict between these two criteria of stability in the movement's final cadence, raise a significant interpretive question. Why does Ligeti prepare us so well for a final moment of cadential stability, but provide it only in part. Let me propose two possibilities. First, we could read the conflict of stability and instability at the final cadence as being the most fitting end to a movement that emphasized this tension so strongly. That Ligeti "prepares" a final stable resolution and then denies it would not be artlessness; rather the "preparation" is essential to the projection of that tension in the final cadence. This tension happens on two levels: the conflict of acoustic dissonance with contextual consonance (and vice versa), and the conflict of the achievement of an answer to the C/E question (E being the final melodic and harmonic resting point) with a failed recapturing of simultaneous acoustic and contextual consonance.

Second, we could read this denial of the the prepared resolution, this failed recapturing, as a purposeful attempt at misdirection from Ligeti. Numerous statements by Ligeti, primarily in interview of the early 1980s, downplay the significance of *Passacaglia ungherese* and *Hungarian Rock* in Ligeti's compositional output, directing attention instead to his 1977 opera, *Le grand macabre*, and the "real" compositions of the early 1980s—the Horn Trio (1982), the Études for piano (1985), and the Piano concerto (1986/88). In the final chapter, I discuss this further,[9] but for now, let me simply offer the possibility that just as Ligeti downplayed these heavily triadic works with strong relationships to tonal practice in his rhetoric,

[9] I also discuss this issue in greater detail in my unpublished essay, "'Ligeti's Stylistic Caesura'? or Toward a History of Harmony in Ligeti's Late Works," a draft of which can be found at http://kris.shaffermusic.com. Quinn 2009 discusses a similar phenomenon surrounding *Clocks and Clouds*—1973—and its harmonic structure.

perhaps the final cadence of *Passacaglia ungherese* is meant to downplay or detract from the perception of the structures in this movement with strong ties to tonal practice. In the case of either interpretation, the effect is subtle, but it is meaningful.

SUMMARY

In the statistical analysis of Chapter 2, we found that *Passacaglia ungherese* exhibits a low negative correlation with the two tonal corpora. This suggests the possibilities that Ligeti is composing music with little-to-no resemblance to tonal harmonic structures; or that Ligeti may be actively countering tonal expectations in his chord-to-chord progressions. However, the preceding analysis demonstrates that there are significant relationships between Ligeti's harmonic and harmonic-formal structures in *Passacaglia ungherese* and those of traditional tonal music—some overt, and others more subtle. Ligeti makes use of some specific tonal structures and the expectations they generate from listeners' implicit knowledge of Western tonality, and those expectations in conjunction with a diversity of syntactic practices—ranging from typically tonal to contradictory of typical tonality—presents a contrast of stability and instability that is greater than that of triadic tonal syntax. He accomplishes this through an idiosyncratic mixture of typical and atypical progressions between dissonant and consonant sonorities, a use of acoustic consonance and dissonance in the articulation of small- and large-scale formal units, a projection of *contextual* consonance and dissonance (based on the order of acoustic consonances in the ground) that also function in ways supporting formal articulation, and a large-scale formal structure reminiscent of some of the most common structures in common-practice tonal music.

If we consider this movement to be "neither tonal nor atonal"—as Ligeti suggests—we miss out on the most unique and powerful aspects of the composition. The pro-

jection of stability and instability at key moments in the form is possible only because of Ligeti's engagement of *both* tonal and atonal practices, activating listeners' tonal expectations and providing a wide range of degrees of fulfillment and denial of those expectations. Not only are tonal structures significant elements in Ligeti's compositional toolkit for this work, but engagement with those structures and their role within the form of this movement is essential to an analytical reading of this work.

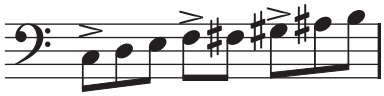
IV. ANALYSIS – ÉTUDE FOR PIANO NO. 4, "FANFARES"

As noted in Chapter 2, Ligeti's fourth piano étude, "Fanfares," is the movement whose harmonic progressions exhibit the highest correlation with the tonal corpora, according to the key-agnostic root-motion paradigm used in that analysis. Further, of all the movements considered in this dissertation, "Fanfares" has received the most attention from analysts. Thus, this movement seems an ideal locus for critical consideration of the standard tonal-vocabulary-but-not-tonal-syntax argument regarding Ligeti's use of the tonal triad. However, the analytical attention paid to this work is still fairly minimal, and most published works provide little to no treatment of the harmonic structures of the movement (c.f. Michel, 1995; Floros, 1996; Toop, 1999). When analysts have engaged the harmonic structures of this movement, the result is usually a reiteration of the tonal-vocabulary-but-not-tonal-syntax interpretation, but typically without much analytical detail from this specific movement in support of that claim (Steinitz, 1996; Steinitz, 2003; Searby, 2010). Two scholars, however, provide more detailed analytical accounts of the harmonic structures of this movement, and it is worth considering their arguments before proceeding with my own analysis. But first, I will provide a bird's-eye view of the movement's formal and harmonic structure, to provide a frame of reference for the discussion of the work of these analysts.

FORM

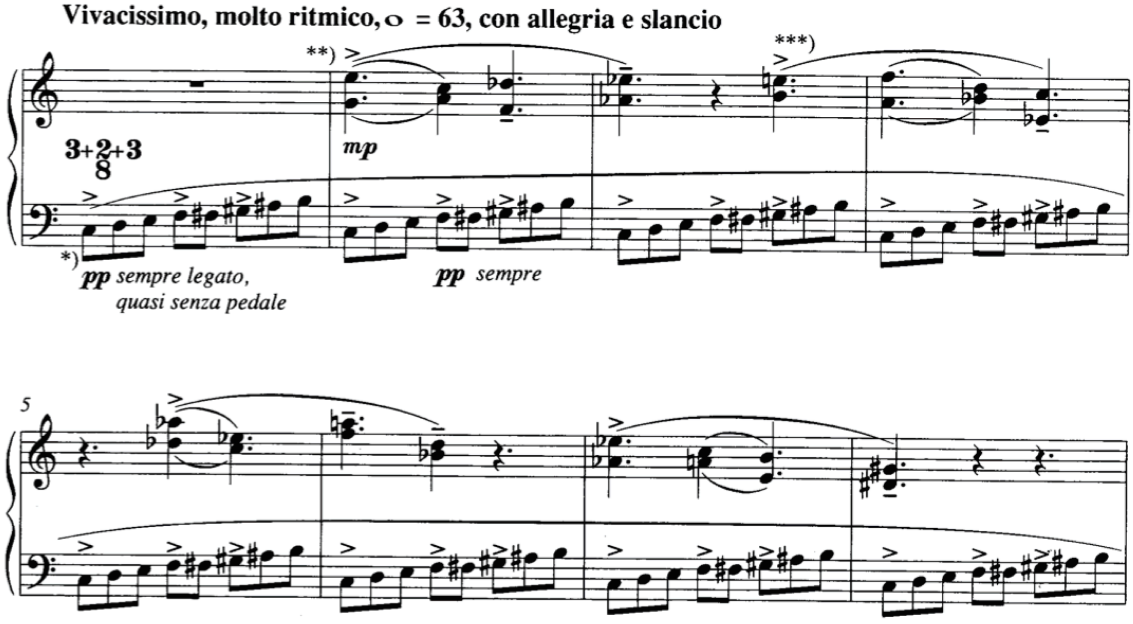
"Fanfares" is based on a one-bar ostinato, the same used in the second movement of the Horn Trio.

Figure 4.1. One-bar ostinato for "Fanfares."



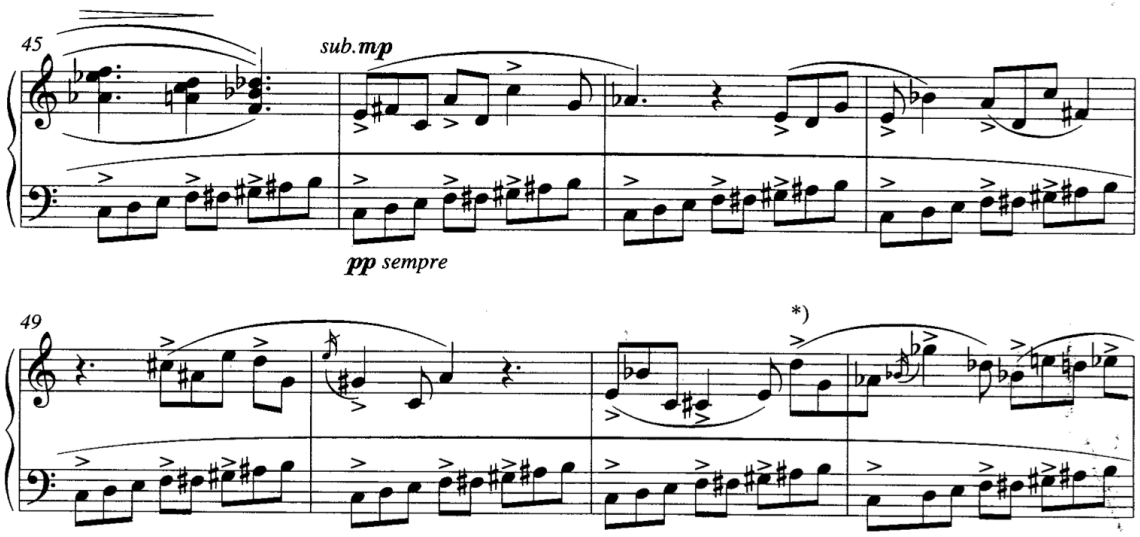
As has been noted in published analyses, this ostinato is based on a diatonic tetrachord (C, D, E, F) and its tritone transposition (F-sharp, G-sharp, A-sharp, B)—Messiaen's sixth mode of limited transposition (Cuciurean 2000, p. 122). This ostinato is present throughout the movement, in various registers, with accents always on C, F, and G-sharp. In the opening bars of the movement, the hand not playing the ostinato plays a succession of dyads, rhythmically aligned with these three accented pitches, always forming a major or minor triad with the accented ostinato pitch—major triads when the ostinato is in the lower voice, minor triads when the ostinato is in the upper voice.

Figure 4.2. "Fanfares," mm. 1–8.



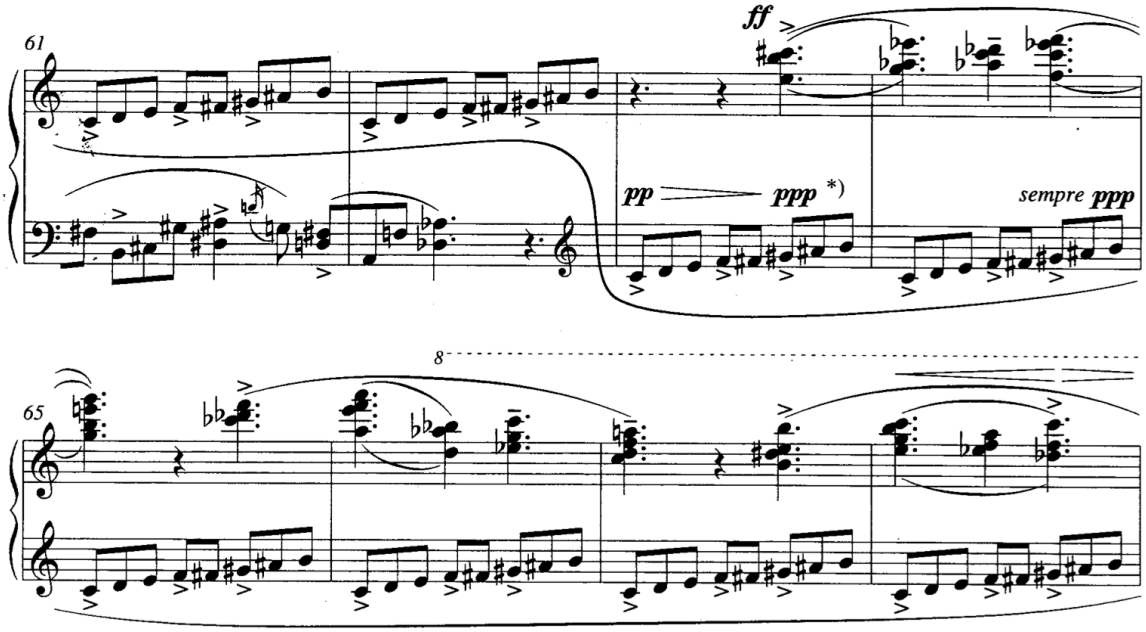
This pattern of eighth-note ostinato in one hand and counting-pulse chords in the other holds from the opening until m. 45, and throughout this passage the alternation of a major-chord "phrase" with a minor-chord phrase gradually degenerates as the harmonies become more complex—adding seventh chords and diminished chords to the mix. At m. 46, the non-ostinato hand changes to a mostly-eighth-note line in counterpoint to the ostinato, dominated by leaps.

Figure 4.3. "Fanfares," mm. 45–52.



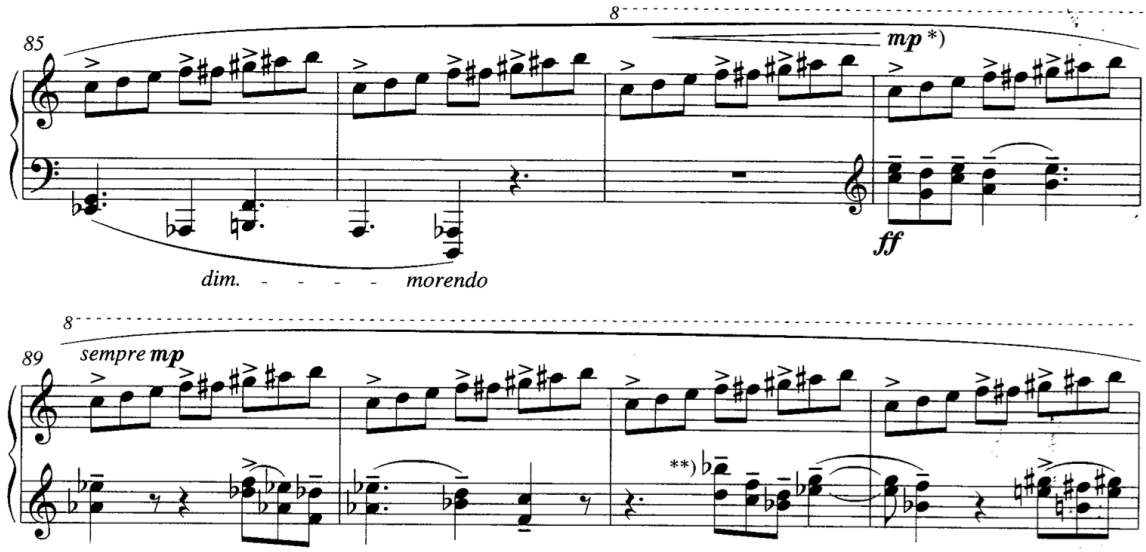
At m. 63, the counting-pulse chords return, but this time they are all seventh chords, rather than triads.

Figure 4.4. "Fanfares," mm. 61–68.



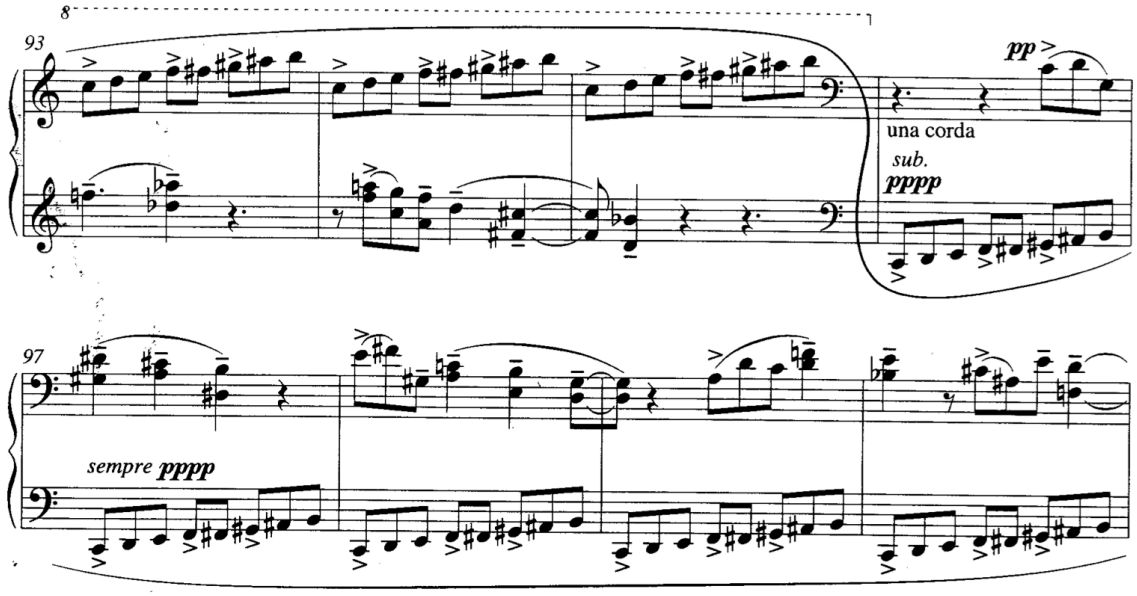
At m. 88, a new melodic (non-ostinato) motive is introduced—the "fanfare" motive. This motive—the first to be labeled "fanfare" in Ligeti's sketches for this movement—is a loud, bright, flourishing gesture that begins with a horn-fifths figure.

Figure 4.5. "Fanfares," mm. 85–92.



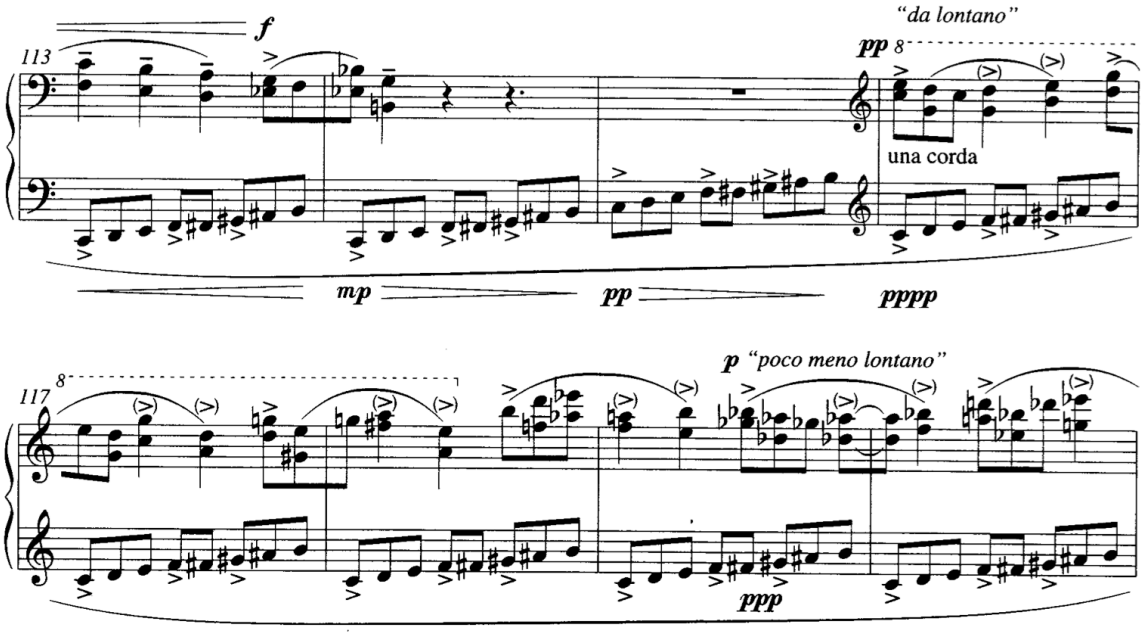
At m. 88ff., the figure is similar to the opening four-chord sub-phrases, with the first chord replaced by a three-eighth-note horn-fifths figure. Thus, at first, this motive seems more like a development of the opening chordal pattern, making use of rhythmic elements from the contrapuntal line of m. 46ff. Such an interpretation would be bolstered by the bass melody of m. 96ff., which sounds very much like the contrapuntal line of m. 46 with the single tones of the longer notes replaced by dyads.

Figure 4.6. "Fanfares," mm. 93–100.



However, at m. 116, the full "fanfare" theme enters and makes clear that what previously sounded like development or combination of the material of the opening and m. 46 was actually preparatory material for the appearance of the central thematic material of the movement. After the statement of this "fanfare" theme (including the initial statement, mm. 116–119, and three varied transpositions, mm. 119–129), the remainder of the movement is a development, of sorts, of this "fanfare" material, culminating in a written-out rallantando (mm. 171–197, now reminiscent of the opening ostinato-and-chords texture) and a final flourish and rallantando/diminuendo (mm. 202–214).

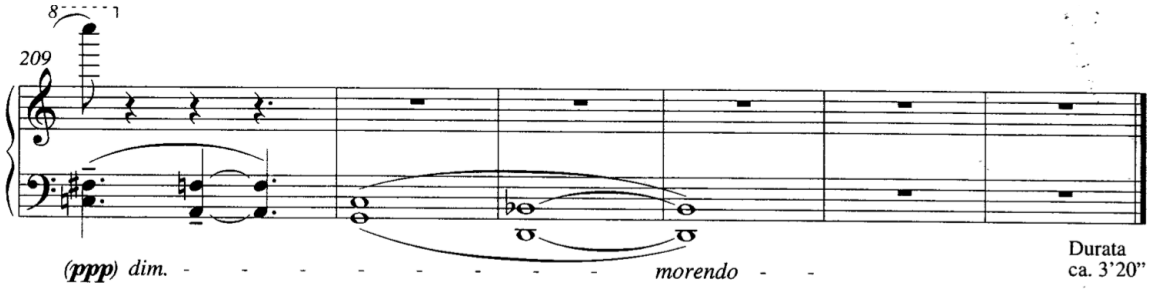
Figure 4.7. "Fanfare" theme from m. 116ff.



On the large scale, we can read this form as a gradual build to the appearance of the primary thematic material in m. 116, followed by the gradual liquidation of that material building into a dynamic climax (m. 197) and a final reminder of the primary material as the movement winds down in speed and volume. In the first 87 bars (before the appearance of the fanfare motive), the harmonic vocabulary begins with all consonant triads and gradually becomes more dissonant. At m. 88, the new motive appears accompanied by a return to primarily major triads, with some minor triads and seventh chords, as well. Again, the harmonic vocabulary becomes gradually more complex through the use of more and more seventh chords and non-tertian sonorities, culminating in mm. 177 to the end, where hardly any consonant triads can be found. In the last three sonorities (dyads), Ligeti returns to the consonance of the opening and recaps the horn-fifths motive one last time, with a minor sixth A/F (the inversion of the usual opening interval, were we in F major), a perfect fourth G/C

(an inversion of the usual middle interval in F major), and a minor sixth (the expected final interval of a horn-fifths progression, but now in B-flat major).

Figure 4.8. "Fanfares" final horn-fifths motive, mm. 209–212.



THE ANALYTICAL LITERATURE

With this formal trajectory and general harmonic scaffolding in mind, let's now consider the analytical work of two scholars who offer some significant insights into the harmonic structures of this movement. The first is John Cuciurean, whose dissertation "A theory of pitch, rhythm, and intertextuality for the late music of György Ligeti" (2000) considers the voice-leading of the harmonic progressions in the opening of "Fanfares" from a neo-Riemannian perspective, following Richard Cohn's work on "maximally smooth cycles" (Cohn 1996, *Music Analysis*). The second is Eric Drott, whose article "The Role of Triadic Harmony in Ligeti's Recent Music" (2003) puts forward what is likely the most nuanced version of the tonal-vocabulary-but-not-tonal-syntax interpretation and considers the historical significance of Ligeti's use of the triad and triadic progressions in relation to arguments made by Schoenberg, Boulez, and Adorno. I will consider them each in turn.

Cuciurean's analysis of "Fanfares" (2000, p. 120ff.) focuses solely on mm. 1–17 (the first phrase comprised entirely of major chords and the second phrase comprised entirely of minor chords); however, he offers two helpful insights into Ligeti's approach to harmony in

this work. The first insight regards the possibility of analyzing these chords in terms of a controlling tonic. While he does not argue that this movement, or even this opening passage, is "in F" (or any other key), he follows on an instinct of a number of Ligeti analysts that F and A-flat play a strong role in the harmony of these opening bars. Several analysts have noted the propensity for the sub-phrases (as I am calling these four-chord statements) of the opening chordal passage to end with F-minor or A-flat-major chords, or others closely related. Further, the three notes of the ostinato that these chords harmonize are the notes of the F-minor triad (C, F, G-sharp/A-flat), and F is the only pitch class that can harmonize all three of these ostinato pitches as a triadic root (c.f. Cuciurean 2000, pp. 122–25; Drott 2003, pp. 283–85; Searby 2010, pp. 129–30). Taking this potential for F or A-flat to serve as a central or organizing pitch class, Cuciurean analyzes the opening two phrases with roman numerals, reckoned against F and A-flat as tonics. He finds that when reckoned against F (major for the first phrase and minor for the second), Ligeti largely privileges and avoids the same kinds of progressions in each phrase, and many of the privileged scale-step-to-scale-step progressions in these phrases are among the privileged progressions in tonal syntax (I to IV, I to VI, III to VI, V to I, etc.). While one would be hard-pressed to say that this opening passage is in F, and while extended functional tonal progressions are not the norm here, the similarities between the major and minor phrases and the correlation between Ligeti's preferred progressions here and those of tonal syntax certainly open the question as to the kind and extent of the relationship between the harmonic structures of "Fanfares" and the traditional patterns of tonal-harmonic syntax.

Cuciurean's second insight of note for this project regards the pitch-class-space voice leading between successive chords in these opening two phrases of "Fanfares." Building on the work of neo-Riemannian theorists—and specifically the "maximally smooth cy-

cles" of Richard Cohn (1996)—Cuciurean maps the chords Ligeti uses in these opening bars according to "voice leading efficiency" (VLE, the minimal number of semitone steps required to transform one triad into another; p. 132), finding that the 13 triads Ligeti uses in the opening two phrases can support a maximally smooth cycle. However, Ligeti avoids the maximal-VLE chord progressions that are fundamental to such a cycle; thus no maximally smooth cycle occurs in these opening chord successions. Interestingly, though, the reason for this absence of maximally smooth chord-to-chord motions is that they require a change in chord quality, which Ligeti only uses at the junctures between the all-major and all-minor phrases; within a phrase, all the chords are the same quality. With this in mind, then, Cuciurean points out that Ligeti's chord progressions in these opening phrases emphasize the smoothest possible chord progressions that involve chords of the same quality, those with a VLE of 2 or 3 (p. 137). Ligeti sets up compositional parameters that result in the potentiality for a maximally smooth cycle (the 13 major and minor triads that can harmonize F, A-flat, or C), but sets up another compositional parameter (phrases limited to a single chord quality) that eliminates the possibility of a maximally smooth cycle. Then Ligeti composes chord progressions that are almost as smooth as possible without being maximally smooth. Cuciurean concludes from this that Ligeti uses simple background procedures to create complex-sounding musical surfaces (p. 137), and that his system relates to tonal practices while avoiding "conventional tonal syntax" (ibid.). Taken together with the data from Chapter 2 of this dissertation, which shows the root progressions of "Fanfares" to have very low correlation with a random succession of the same chords but a moderately high correlation with the root motions of two tonal corpora, Cuciurean's findings suggest that a detailed look at passages in this movement beyond m. 17 may reveal further interesting relationships with tonal-harmonic structures.

Eric Drott's (2003) article, "The Role of Triadic Harmony in Ligeti's Recent Music," is the other scholarly work that offers significant insight into the harmonic structures of "Fanfares" by way of some detailed analysis. Drott's thesis is that:

> Ligeti's use of the triad in his music dating from the 1970s onwards exemplifies . . . a desire to negotiate a position between what he sees as the totalising (and thus reductive) claims of modernism and postmodernism—a position between a blind affirmation or an equally blind negation of convention (p. 287).

Drott outlines in detail the arguments of Boulez, Adorno, and Schoenberg against the use of the triad in new music. In the case of Adorno, the triad dishonestly, unethically, even violently subsumes elements of individual lines into a single harmonic element. In the case of Boulez, the same cognitive/acoustic property of *tonal fusion* causes the triad to interfere with the perception of serial structures. In Schoenberg's case, the triad itself is not necessarily off-limits, but first, a composer would need to figure out how to minimize, or eliminate altogether, the formal-syntactic claims that the consonant triad makes on listeners familiar with tonal music. Drott argues that through compositional devices that direct the listener's attention to linear processes, Ligeti is able to preserve the integrity of the lines and to minimize the perception of the presence of the triad and, thus, minimize its syntactic claims, as well. Ligeti, then, "challenges the cohesive function of triads, even in the process of restoring them" (p. 309). Ligeti is able to answer the criticisms and concerns of Adorno, Boulez, and Schoenberg, working against the modernist "desire to escape or obliterate convention" without rejecting modernism entirely (p. 308). "Instead of simply affirming the tradition that gave rise to triadic harmony, Ligeti's music . . . strives to negate the modernist tradition of negation" (ibid.).

Drott's analysis of the linear and harmonic structures of "Fanfares," like Cuciurean's, is limited to the opening section of "Fanfares," where the dyadic part moves at the rate of the

counting pulse (quarters and dotted quarters). In this passage, Drott claims that, according to principles of *auditory streaming*, Ligeti's linear and rhythmic structures interfere with the triadic intersection of lines. Whereas rules of voice-leading in tonal and pre-tonal music are meant to lessen "the phenomenal impact of dissonance" (p. 292; see also Wright and Bregman, 1987, Huron 2001), Ligeti's linear and rhythmic patterns "work instead as a means of suppressing one's perception of the consonant sonorities themselves" (ibid.). Thus, Ligeti is able to incorporate the tonal triad without it projecting tonal-syntactic claims on the listeners or interfering with the linear and rhythmic structures, which are of such great importance to this movement.

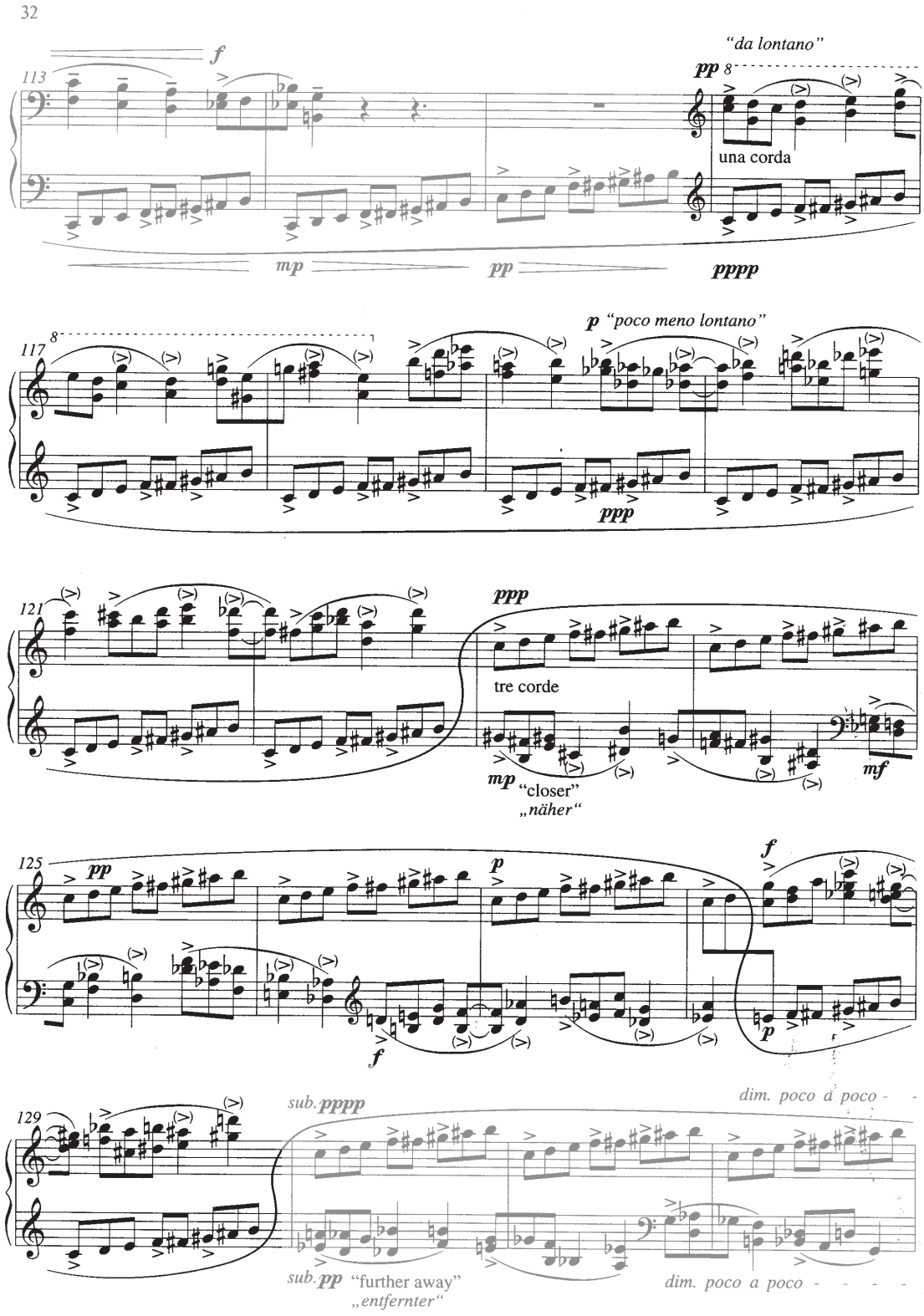
While I find much of Drott's article compelling, I see three primary problems with his analysis and his conclusion that meaningful, tonality-related harmonic progressions are not operative in this movement. First, by focusing his analysis on the opening bars of the movement, he is in a sense stacking the deck: the opening bars see a clear registral, dynamic, rhythmic, and durational distinction between the ostinato line and the dyad line. Drott's analysis based on the principles of auditory streaming may hold here (though, I will argue that they are not prohibitive of a listener attending to the triads and perceiving harmonic structures in spite of the lines), but it does not necessarily follow for the entirety of the movement. For instance, the contrapuntal texture at m. 46ff.—two single-note lines, often close in register, and with the non-ostinato line full of leaps; see figure 4.3—is sufficiently different to warrant a new analysis of the potential effects of auditory streaming on the perception of consonance and dissonance between the two lines. Further, the "fanfare" motive described above (which comes in its full form at m. 116; see figure 4.9) is highly chordal and—like m. 46—contrasts rhythmically with the ostinato to a much lesser degree. Thus, it is possible that Drott's analysis is valid for the opening bars of the movement, but he has not es-

tablished its validity for all of the different rhythmic and contrapuntal textures found in the movement.

Second, while it may be possible that Ligeti's linear and rhythmic devices direct listener attention to the individual lines over the harmonic structures, that does not prohibit a listener from intentionally directing attention to the harmony and perceiving structures not salient on a first or casual hearing. Nor does it prohibit an analyst from analyzing a score away from a full-speed performance to discover structures that are present and significant, if not readily perceptible. In fact, such analysis is the rule, rather than the exception, for twentieth-century music; the presence of triads need not rule out such a practice. And in light of Ligeti's tendency to purposely misdirect analysts away from certain traits of his music and toward others, it is possible, interesting, and meaningful that Ligeti would include triadic structures and direct out attention elsewhere. I would argue (following Wilson, 2004) that discovering those "hidden" structures—if they exist—and interpreting both their presence and Ligeti's suppression of their perception is the proper task of an analyst who approaches this work.

Lastly, Ligeti very well may seek to suppress the perception of consonances in this movement; however, as my analysis to follow will show, Ligeti's sketches for this movement (and the statistical correlation of this movement's structures with those of the tonal corpora discussed in Chapter 2) suggest that Ligeti took care in considering which harmonies and which harmonic progressions would be used at specific moments in the form of "Fanfares," and that properties of traditional tonal syntax were a factor (conscious or otherwise) in those choices. Without further ado, then, let us proceed to that analysis, in order better to understand and interpret both Ligeti's composition and the claims that have been made surrounding it.

Figure 4.9. "Fanfares," mm. 116–129.



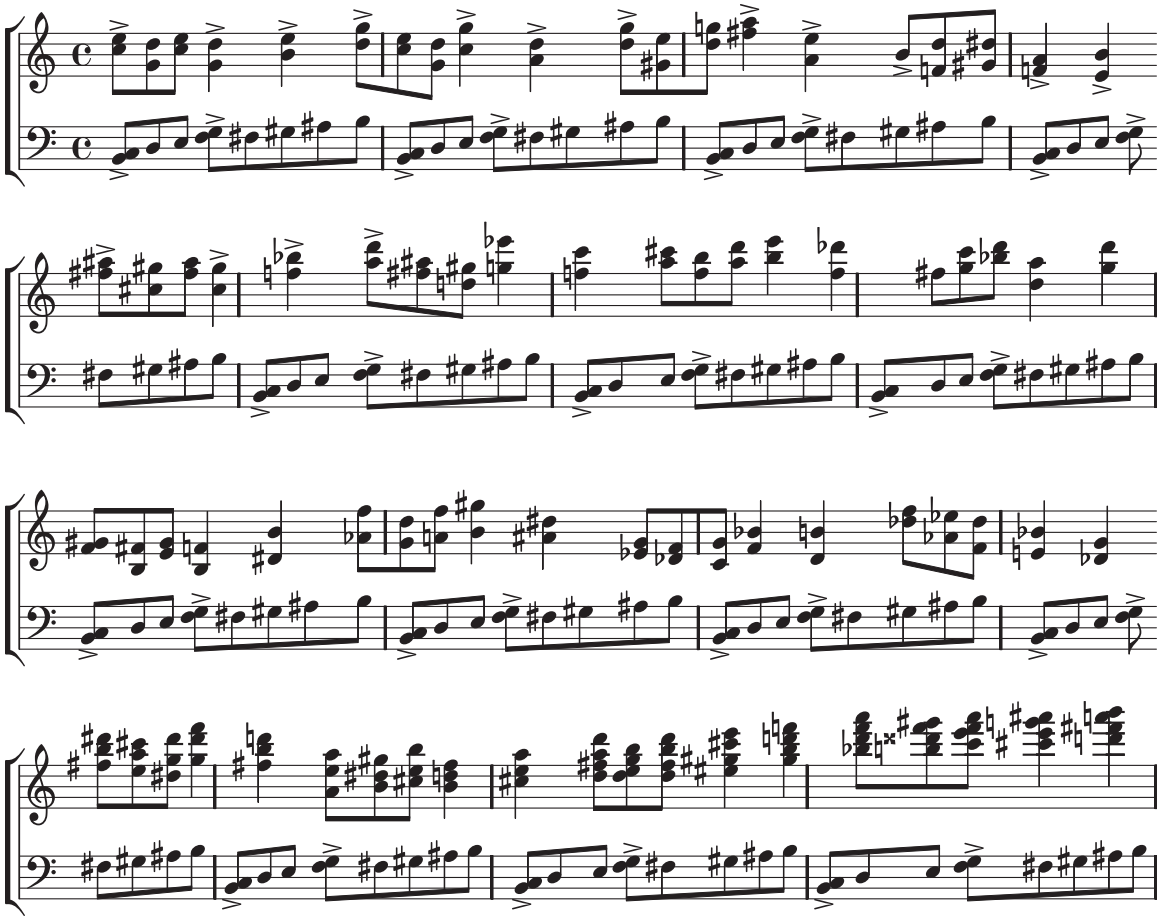
ANALYSIS

For this analysis, I will focus on a single, yet significant passage in "Fanfares"—the full presentation of the "fanfare" theme beginning at m. 116. (Ligeti gives the melodic theme of mm. 116–119 the label "fanfare" in his sketches early in the compositional process; see p. 7 in the *Skizzen* folder for "Fanfares" in the Ligeti Collection at the Paul Sacher Stiftung.) This passage is the central passage in the form of the movement and—as the above description of the movement's form describes—the primary source of the thematic material throughout the rest of the movement. It is also the passage that is most problematic for many of the claims made by Ligeti scholars about this movement and Ligeti's general use of the triad, and it is the passage for which we have access to the most sketch material, allowing us to make some very detailed analysis of Ligeti's structures *and* the specific choices he made in the process of composing those structures. Thus, a detailed analysis of this passage has the greatest potential for understanding the structures at work in the movement and Ligeti's intentions—conscious or otherwise—in the composing of those structures. As the following analysis shows, the effect of Ligeti's harmonic choices in the composition of this passage is to generate a strong sense of tonal propulsion as we move forward in time, while simultaneously avoiding cadences and unambiguous, long-term tonal goals.

Figure 4.9 provides a reproduction of the passage in question, the first full presentation of the fanfare theme (mm. 116–129). In the sketches for the Piano Études in the Ligeti Collection at the Paul Sacher Stiftung, there is an alternate (earlier) version of this passage, reproduced in figure 4.10. It is worth noting that, while there are other passages in this movement for which Ligeti sketched multiple versions, this passage is unique in that it is an extended passage where the sketch version and the final version are very similar. The rhythmic profiles are the same, the gestures are the same, and the melodic contours are

largely preserved between the two versions. There are slight melodic changes between the two versions, but the primary difference (and likely the difference that causes the melodic changes) is in the domain of harmony. Thus, it is an ideal locus for examining Ligeti's harmonic structures and the choices he made.

Figure 4.10. "Fanfares" sketch, mm. 116–129 (reproduced from manuscript sketch on p. 6, Skizzen folder 2/9, Piano Études, Ligeti Collection, Paul Sacher Stiftung).

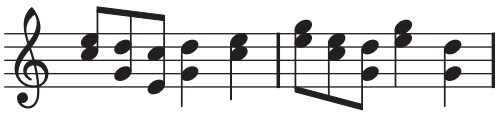


It is also worth noting parallelisms in the passage's structure. That is, each 28-eighth-note phrase (each single system in figure 4.10) is a varied, transposed repetition of the first phrase. Comparing the varied, transposed phrases with straight, transposed versions can further elucidate the significance of Ligeti's harmonic choices. Each 28-eighth-note phrase is

also composed of four seven-eighth-note sub-phrases[10], each of which bear strong resemblance to the first seven-eighth-note sub-phrase. Comparing the structural properties of each sub-phrase to the original can also provide insights into Ligeti's structural choices. And finally, the first sub-phrase bears a strong resemblance to a typical *horn-fifths* figure (as does the opening motive of Ligeti's Horn Trio of 1982)_ Comparing a standard horn-fifths figure with Ligeti's opening sub-phrase can also provide insight into Ligeti's harmonic choices. This gives us a six-layer structural hierarchy that we can use to make comparisons between adjacent hierarchical levels and gain a better understanding of Ligeti's choices: 1) a normative horn-fifths harmonization of the first sub-phrase, 2) Ligeti's original version of the first sub-phrase (alteration of no. 1), 3) the original first phrase of the fanfare theme (no. 2 with three variations), 4) a version of mm. 116–129 comprised of straight transpositions of the first phrase, 5) the altered transpositions of the first phrase of the fanfare theme found in the complete sketch (alterations of no. 4), and 6) the final, published version of this passage (alteration of no. 5).

Let's begin on the small scale. The first two sub-phrases of this passage contain melodic notes of C, D, E, and G (the sketch version contains only D, E, and G)—notes that lend themselves to harmonization according to a horn-fifths schema in C major. Here are the first two sub-phrases harmonized according to a standard C-major horn-fifths schema:

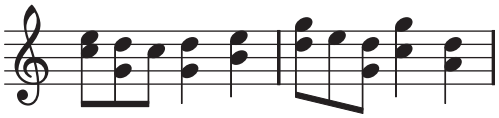
Figure 4.11. Fanfare melody (mm. 116–117) harmonized according to a traditional horn-fifths schema.



And here are those two sub-phrases in the final version:

[10] I am using the terms *sub-phrase* and *phrase* unapologetically as analytical expedients, without any reference to cadences, periods, or sentences.

Figure 4.12. Fanfare melody (mm. 116–117) harmonized as in the final score.



The differences—aside from two missing notes, notes which would double the ostinato at the unison or octave—are small, but significant. The first difference comes in the second quarter note of the first sub-phrase: the final version (and the sketch version) harmonize the melody's E with an inner-voice B, rather than the C expected in a horn-fifths schema. The reason for this difference is likely the harmonic results when considered with the ostinato: were Ligeti to use a C/E dyad, the G-sharp of the ostinato would complete a C-augmented triad. The B/E dyad with the G-sharp, however, generate an E-major triad, a more consonant sonority (though both are tertian).

The second difference comes on the first eighth note of the second sub-phrase: the final version (and the sketch version) harmonize the melody's G with a D, rather than the expected E in a horn-fifths schema. The reason for this difference is less clear than in the previous chord. The resulting chord in the final score is a G-major triad, but the horn-fifths E/G dyad combines with the ostinato B to create an E-minor triad. Both are consonant, both have roots that have already been heard, and both are present in the key of C major, which would be strongly projected by a clear horn-fifths harmonization (and which is the strongest potential "key" of the two bars in question, both when considering the melody's diatonic collection and the prominence of C and G dyads and triads). There also does not seem to be a voice-leading issue in the inner voice that would dictate the need for D rather than E at this moment. Two possibilities remain, then, as potential reasons for Ligeti's choice here: he prefers a major chord over a minor chord, or he prefers a chord with the root of G when com-

pared with a root of E. Considering the latter possibility, this could be because Ligeti prefers G over E in its own right, or because of the implications for the harmonic progression.

The next difference comes in the first quarter note of the second sub-phrase. In this case, a horn-fifths schema would harmonize the melody's G with an E, but Ligeti chooses C. This C/G dyad combines with the ostinato E to form a complete C-major triad; the horn-fifths E/G dyad would form a doubled dyad with the ostinato. Here, Ligeti works to form a complete, unambiguous triad rather than a dyad. However, Ligeti had two consonant triadic options at his disposal: C major and E minor. Once again, E minor is the loser, but here the reasoning is straightforward in light of the horn-fifths schema, which is a two-voice alternation of incomplete C- and G-major chords.

The last difference between the first two sub-phrases and the horn-fifths harmonization comes on the last quarter note: the D is harmonized by an A, rather than the expected G. This change is clearly to include a consonant triad (D major) rather than a dissonant sonority (D, F-sharp, G; 015).

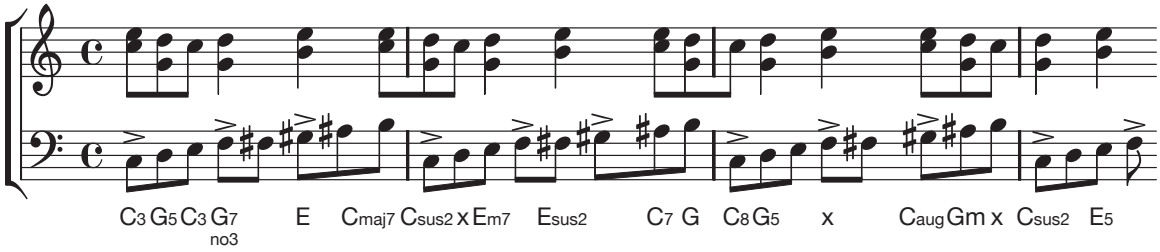
The melodies for sub-phrases three and four deviate from the pitches usually harmonized with a horn-fifths pattern, so we will refrain from comparing them with a horn-fifths projection. However, in the first two sub-phrases, there are some potential general preferences in Ligeti's harmonies for this passage. Specifically, these alterations of a standard horn-fifths schema suggest that Ligeti prefers consonant sonorities over dissonant ones (including augmented triads), complete triads over dyads, and—in this context—C- and G-major triads over E-minor triads. Taken together, Ligeti seems to prefer chords that are consonant and unambiguous, and that clearly project the key of C major.

Let's continue the examination of Ligeti's harmonic choices by looking at the relationship of the second through fourth sub-phrases of the fanfare theme with the first, of

which they are variations. The first comparison we can make is simply to consider what harmonies would result were Ligeti to repeat the first phrase four times. Such a comparison emphasizes the effect that the rhythmic arrangement has on the potential harmonic structures. Because the ostinato repeats in eight-eighth-note units, but the fanfare motive repeats in seven-eighth-note units, each repetition of the fanfare motive matches its constituent chords with different ostinato notes. The first fanfare dyad matches the first eighth note of the ostinato the first time, then the eighth, then the seventh, and so on. The second dyad matches the second eighth note of the ostinato, then the first, then the eighth, and so on. Since the ostinato is comprised entirely of semitone and whole-tone ascents, most eighth-note rhythmic shifts will turn a consonant triad into a dissonant sonority. Many consonant (doubled) dyads will, likewise, become a dissonance when the ostinato pitch changes, though not to as great a degree as with triads.

We can see the difficulty of preserving the consonance of a sub-phrase by repeating it seven eighth notes later by examining the chords that would result if the original seven-eighth-note sub-phrase were repeated four times over the eight-eighth-note repeating ostinato.

Figure 4.13. Fanfare motive (m. 116) repeated verbatim over ostinato. "x" denotes non-tertian, dissonant sonority.



While this passage in the final score contains 18 consonant dyads or triads (mostly triads) and 2 seventh chords or dissonant sonorities, the repeated-motive version contains just 8 consonant dyads or triads (mostly dyads), 1 unison, and 11 seventh chords or dissonant so-

norities. Thus, as Ligeti repeats the motive, the changes in the original figure that produces the second, third, and fourth sub-phrases are changes that greatly privilege consonant sonorities.

Altogether, this analytical exercise highlights two key features of this passage and Ligeti's approach to harmony in this movement. First, Ligeti's choices of pitches in the non-ostinato line are determined in large part by the verticality they would form with their respective ostinato pitches. Specifically, Ligeti prefers consonant dyads and triads to seventh chords, suspended chords, and other dissonant sonorities. Second, the increase in chromaticism and distance from the original white-key collection as the passage progresses is not due to a desire to *increase* harmonic complexity, but rather to *maintain* a high degree of consonance in the harmonies that result from the combination of dyads and ostinato pitches.

With these things in mind, let us look at the sketch for the passage in question. This sketch is an intermediary in the compositional process and in musical similarity between the original fanfare motive and the final score for mm. 116–129. Thus, examining it in light of the fanfare theme, and using its analysis as a basis for examining the final score can help us a great deal in understanding Ligeti's choices and priorities in the construction of a harmonic succession in this passage.

Recall the sketch version of the passage in question from figure 4.10. This version possesses the same general framework of the final score: four seven-eighth-note sub-phrases form a 28-eighth-note phrase; this first phrase matches the fanfare theme on p. 7 of the *Skizzen* material exactly. That phrase is then repeated three more times on different pitch levels, with greater or lesser degrees of variation relative to the original phrase. Specifically, phrases two, three, and four are varied transpositions of the original. If we consider the first phrase to be "in C," based on the diatonic collection and the horn-fifths schema, we can consider the

subsequent phrases in the sketch to be transpositions to F-sharp, E, and B, respectively. Because this theme matches an eight-eighth-note ostinato with a seven-eighth-note thematic pattern, each subsequent sub-phrase and phrase begin on a different metrical position relative to the ostinato. Thus, the first and third phrases begin on the downbeat of the ostinato (C), and the second and fourth phrases begin on the fifth eighth-note (F-sharp). Taken alongside the transpositions chosen by Ligeti, this is interesting. Because the first four pitches of the ostinato (C, D, E, F) transpose up a tritone to obtain the last four notes of the ostinato (F-sharp, G-sharp, A-sharp, B), an exact transposition of the first phrase from C to F-sharp beginning on the fifth eighth-note of the bar (F-sharp) will obtain the same chord succession as the first phrase, transposed up a tritone. Thus, a comparison of these first two phrases is a good starting point for exploring the harmonic-syntactic structure of this sketch passage.

Figure 4.14. Phrase two (from mm. 119–122), exact transposition of original sketched fanfare theme to F-sharp.

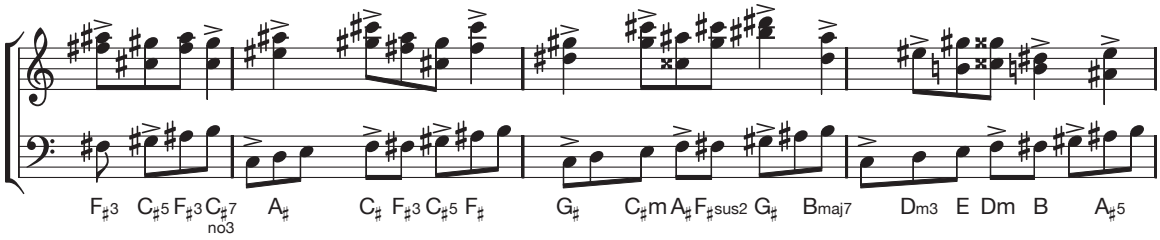
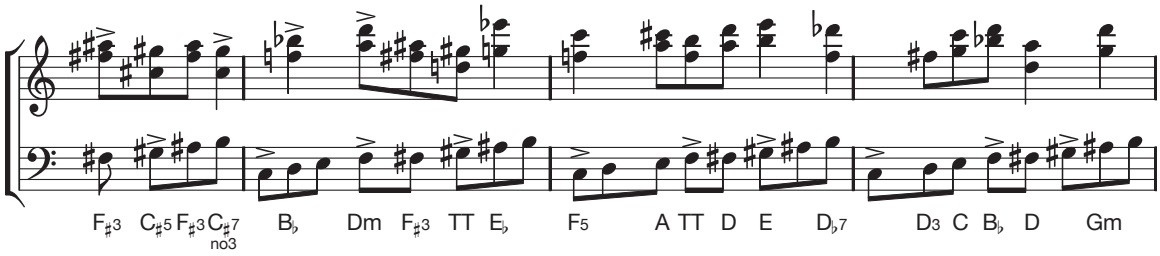


Figure 4.15. Phrase two (from mm. 119–122), sketched version (from figure 4.10).



Figures 4.14 and 4.15 compare an exact transposition of the fanfare theme to F-sharp with the F-sharp phrase of the sketch.[11] It is easy to see that the first sub-phrase is exactly the same between the two, but the three following sub-phrases are different. In the second sub-phrase, the melodic contour of <– – + –> remains the same, as does the leap-step-leap-leap pattern. What changes is the precise pitches and the harmonies they form with the ostinato. First, there is a shift away from the black-key collection that began the second phrase and toward the white-key collection of the first phrase. Further, though the directional contour remains the same, the high point of the sub-phrase is no longer shared between the first eighth note and the first quarter note; the first quarter note is now a semitone higher, owning the high point for itself. There is also a change in chord quality for almost every sonority: the first chord changes from major to minor, the second remains a major third, the third from fifth to tritone, the fourth remains major, and the fifth from major triad to open fifth. Lastly, the root progression changes: *C-sharp–dyad–C-sharp–F-sharp–G-sharp* becomes *D–dyad–dyad–E-flat–F*. There are two things to note about the root progression. First, though chords change, the root interval between the final two chords remains an ascending major second; and second, the descending fifth from C-sharp to F-sharp is replaced by a tritone that resolves as we would expect a tonal tritone to resolve—D up to E-flat (though not in the same voice), G-sharp (A-flat) down to G. Thus, for this three chord pattern surrounding the high point of the sub-phrase, the general harmonic motion of the straight transposition (descending fifth–

[11] Though the ostinato differs between the sketch and the score, I will be analyzing both according to the ostinato of the score. As I analyze the ostinato of the sketch, the dyads (seen in figure 4–10) involve added notes for the sake of rhythmic emphasis that can be reduced out for the purposes of harmonic analysis. That the ostinato Ligeti uses in the score not only removes these added pitches but matches the ostinato used in the Horn Trio (1982, three years before the Études were published) suggests that the final ostinato was the primary material throughout the compositional process, not simply at the end. Thus, in light of this information and for the sake of clear comparison, I will consider both the sketch and the score themes against the ostinato from the score.

ascending major second) is preserved, but intensified (tritone ascending by semitone–ascending major second).

The third sub-phrase also sees a shift from mostly black keys to mostly white keys. However, this time the general consonance level is preserved, and all chords can be reckoned with a root. The root progression also demonstrates a strong relationship between the two versions: the sketch version is nearly a T8-transformation of the F-sharp transposed version. In other words, the third phrase of the F-sharp varied transposition of the original theme looks more like the third sub-phrase of the original transposed to D than to F-sharp. Here are the root progressions of the original in C, the original transposed to F-sharp, and the sketch version, respectively:

[C:] Gm–E–C^{sus2}–D–F^{maj7}
[F♯:] C♯m–A♯–F♯^{sus2}–G♯–B^{maj7}
[D:] A–F^{-5}–D–E–D♭^{7}

There are two differences in the root progression of the original in C and the transposition to D of the sketch. First, the final chord is D-flat instead of A. This may simply make a smoother transition to the subsequent D/F-sharp dyad in sub-phrase 4. It is also an inverse root progression (descending three semitones instead of ascending). More interesting is the second difference: the use of an F/B dyad in the second position where, based on a straight transposition up a whole tone, we might expect an F-sharp chord. There may be a voice-leading concern here. When E moves to C^{sus2} (or A-sharp to F-sharp^{sus2}), each voice moves by step: E to D, G-sharp to G, B to C. Thus, an F-sharp chord would move smoothly to a D^{sus2} chord in the third sub-phrase of the sketch. However, there would be a common tone F-sharp between an F-sharp chord and a D-major triad. When Ligeti changes the second chord to an F/B dyad, though, the tritone eliminates the common tone, and every voice moves. Further, it intensifies the forward motion of the harmonies. Not only is the tritone a directed

interval in tonal music, but the F/B dyad resolves as we would expect (or as we would expect an F/C-flat dyad to act): F resolves up by semitone, and B resolves down by semitone. Thus, this substitution largely preserves the character of the original version of which it is a variation, but it intensifies the harmonic-syntactic progression by making use of tonal expectations and their fulfillment.

The last sub-phrase of phrase 2 does not see a significant difference in general consonance, and few changes in chord quality. The most significant changes come in the chord progressions. The root-interval succession from the last chord of the previous sub-phrase to the first chord of the following sub-phrase for the F-sharp transposition of the original is:

i3 i2 i10 i9 i11 i2

For the sketch, it is:

i1 i10 i10 i4 i5 i10

Both prefer close motions on the circle of fifths, particularly ic2 (i2 and i10; each two steps on the circle of fifths). However, this does not tell the whole story. For that, we must consider the quality of each chord.

The chord progression for the straight transposition of the fourth sub-phrase is

$$[B^{maj7}]–Dm^{3}–E–Dm–B–A\sharp^{5}–[C^{+}]$$

and for the sketch is

$$[D\flat^{7}]–D^{3}–C–B\flat–D–Gm–[Fm].$$

Looking at these progressions, we can interpret the sketch version of this passage to be a more tonal version than the straight transposition of the original. For instance, in the straight transposition, though the root motions are relatively close on the circle of fifths, the qualities make it difficult to consider most pairs of successive chords to be closely related. That is, the D-minor and E-major triads form the only successive chord pairs that can be in-

cluded in a single major or minor key—A minor; and since this requires the raised leading tone, no pair of successive chords can be included in the same diatonic collection. The sketch version, however, has several pairs of successive chords that can be included in the same key: D major and C major, C major and B-flat major, D major and G minor (allowing for a raised leading tone in G minor), and G minor and F minor.

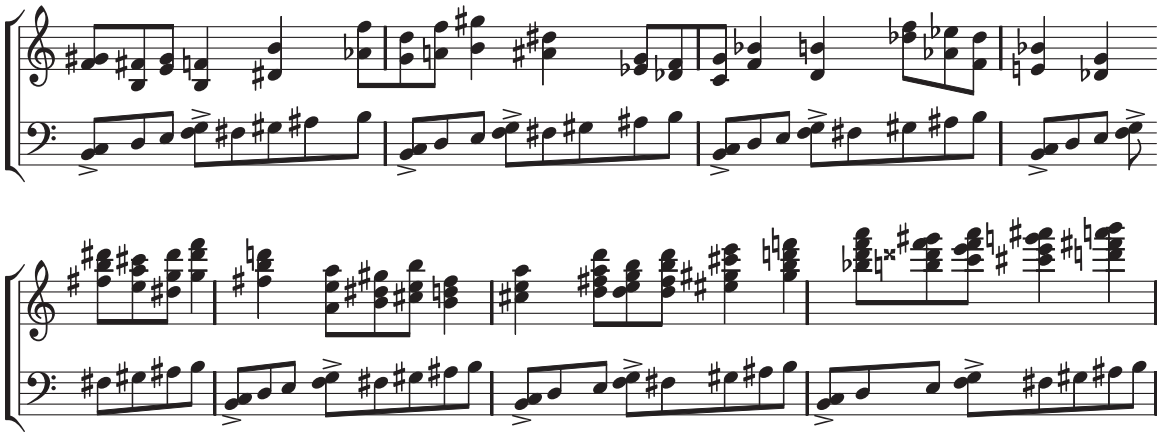
Further, both versions of this sub-phrase contain what approximates a tonal prolongational device—the passing chord—but the sketch version is closer to being idiomatically tonal. That is, the Dm$^{5}_{3}$–Dm$^{6}_{3}$ progression of the straight transposition is prolonged by the wrong chord: a *root-position* triad (E major) whose root is a step *higher* than the chord being prolonged. The D$^{5}_{3}$–D$^{6}_{3}$ progression of the sketch is prolonged by the right chord: a *first-inversion* triad (C major) whose root is a step *lower* than the chord being prolonged. (Of course, the F-natural in the ostinato requires a second passing chord. The second-inversion B-flat chord works well, as second inversion is ideal for linear prolongation, and it has two voices that move in contrary motion by step to chord tones of D major: B-flat to A, F to F-sharp.) This linear prolongation of D, followed by a closely related G-minor triad (which proceeds to its closely related F-minor triad) explains, perhaps, why the sketch version of this sub-phrase sounds decidedly more "tonal" to my ears than the straight transposition of the first phrase.

Taken altogether, we can sum up the difference between a straight tritone transposition of the first phrase with the second phrase of the sketch as follows. First, there is a general trend to migrate from the mostly-black-key collection associated with F-sharp major toward a collection somewhat more populated with white keys—that is, the sketch lessens the tonal distance between the first two phrases, as measured by similarity of pitch-class content. Second, there is a tendency to preserve—or even increase—the general consonance of the

chord content. Third, where new dissonances are introduced—and occasionally where no dissonance is introduced, but chords are changed—the result is an intensified harmonic or voice-leading thrust toward the successive chord. Thus, Ligeti generally makes the tonal motions from one chord to the next smoother (shorter distances) and more directed, or more precisely expected, in the second phrase than in a straight tritone transposition of the first phrase.

When we consider that this difference is not simply one between two versions of the same passage, but between the harmonic-syntactic makeup of the first phrase and the second phrase of this passage, we can see not simply a preference for one kind of harmonic structure over another, but differing formal roles for each. That is, like with a tonal phrase or sentence, the urgency of tonal progression increases as the music progresses in time, as does the precision surrounding the goal. Take Caplin's paradigmatic sentence structure. The first half—the presentation phrase—establishes and prolongs tonic without any cadential motion; the second half—the continuation phrase—liquidates the original material as it builds harmonic tension and moves towards the conventional—a tonal cadence. A related pattern seems to be unfolding in these two "phrases" in "Fanfares": predominately C and G chords and the white-key diatonic collection give way to more distant harmonies as the C-horn-fifths figure gives way to more varied gestures; in the subsequent phrase, the original harmonic patterns are replaced by more directed progressions that better prepare the arrival of subsequent sonorities. The change is not drastic—nor is a single, unambiguous tonal goal suggested—but there is a clear increase in the intensity and directional precision of the harmonic progressions from the first phrase to the second.

Figure 4.16. Phrases 3–4 of sketch (mm. 123–129).



Considering the chord content of the straight transposition version of the third and fourth phrases (transposed to E and B, respectively) and that of the sketch version of the third and fourth phrases (figure 4.16), there is reason to think that such an intensification of tonal-syntactic progression continues. For instance, the straight transposition results in nine dissonant chords in phrases three and four that cannot be reckoned according to any root, and the sketch version eliminates all of these chords: except for one third (first sub-phrase of phrase three), one fifth (third sub-phrase of phrase three), and one tritone (first sub-phrase of phrase three), every chord in phrases three and four of the sketch is tertian (one of the usual triads or seventh chords) or what we might call *extended tertian* (suspended chords, ninth chords, major/minor chords, augmented triads with sevenths, etc.). However, the potential implications of including more chords typical of tonal progressions—including tritone-bearing chords with strong pull towards a specific tonal goal—is not realized in the harmonic progressions of the sketch. For instance, there is a significant increase in the number of seventh chords contained in the third and fourth phrases of the sketch, but only two contain a tritone—one dominant-seventh chord and one diminished-seventh chord. That G-sharp-diminished-seventh chord (third sub-phrase of phrase four) does not progress in a manner typical of a tonal progression: the root ascends by whole-tone (to a B-flat-major-seventh

chord), rather than semitone, and its fifth and seventh (D and F) are common tones with the following chord, rather than resolving down by step. The dominant-seventh chord (third sub-phrase of phrase three) does not resolve down by fifth, as we might expect according to typical tonal progression, nor up by step in a deceptive resolution; however, we might interpret it as an enharmonic respelling of a German-sixth chord, which does resolve according to tonal expectations—more on that when we discuss the final score version of this passage. The tritone (first sub-phrase of phrase three) and the three diminished triads (second, third, and fourth sub-phrases of phrase three) in these phrases also predominately progress in ways atypical of tonal progressions. Only the B-diminished triad in the last sub-phrase of phrase three resolves its root up by step (and its diminished fifth down by step). In light of the fact that Ligeti incorporates an increased number of tritone-bearing sonorities in phrase three (which largely resolve in a manner atypical of tonal music) and a preponderance of seventh chords in phrase four (which also tend to resolve in ways that work against tonal-functional progressions), we can interpret these four phrases of the sketch as containing a gradual increase in dissonance from phrase to phrase, rather than a continual increase in tonally directed progression. The fact that Ligeti uses dissonance to build tension relative to the earlier consonance-saturated phrases, and the fact that that dissonance comes more in terms of tertian and extended tertian chords in the sketch (relative to a straight transposition of the fanfare phrase) shows a relationship with aspects of tonal practice, but not the strong functional relationship that some of the specific progressions of phrase two suggested may be in play.

However, the sketch is not the final version. It demonstrates that during the compositional process of this passage, Ligeti was actively manipulating the chord-quality content and general consonance of the passage, as well as the specific chords and chord progressions.

Further, Ligeti makes changes to his material at times in order to incorporate chord progressions with strong tonal implications. Though the entire passage cannot be reckoned according to one or a series of unambiguous tonics, and though not every chord progression can be analyzed as conforming to the expectations of common-practice tonal-harmonic motion, brief passages do project clear tonics, and brief passages do reflect Ligeti's intentional incorporation of "tonal" progressions. Does Ligeti's active engagement with tonal schemas and syntactic norms continue through the composition of the final version of this passage in mm. 116–129 of the published score?

The short answer is *yes*. Though the final version is not a passage governed by a single unambiguous tonic, nor a series of clear, local tonics, Ligeti continues to manipulate the harmonic structures in such a way that elements of tonal-harmonic patterns appear increasingly in his composition and play a significant role in the articulation of formal structures in this passage.

Let's begin by examining the relationship of the score to the sketch for this passage (figures 4.9 and 4.10). With the exception of phrase four, a large proportion of the material from the sketch is preserved in the score. Examining the specific changes made between the sketch and the score can increase our understanding of the harmonic structures in the score and of Ligeti's engagement with tonal practices.

The first phrases in these two versions are nearly identical; that is, the original fanfare theme made it into mm. 116–119 of the score with minimal alteration. In the first subphrase, the third eighth-note dyad C/E becomes a single C, slightly altering the melody and changing a doubled dyad to a simple dyad. The same change happens on the downbeat of m. 117, where an inner-voice C disappears to change a doubled dyad into a simple dyad. The fourth sub-phrase sees a registral change, as the score is an octave higher than the sketch, but

the pitch material remains the same. The only harmonic change in the entire first phrase comes on the downbeat of m. 118 (sub-phrase three), where a C^{sus2} chord becomes a C^{5} dyad. All of these changes are nearly imperceptible, and none of them affect the root progression.

The second phrase sees similar voicing changes in the first two sub-phrases (and changes in the spelling of black-key pitches). There are two differences, however, that actually change the harmonic succession. The second sub-phrase of the sketch comprises the following chord succession:

Dm–F♯^{3}–TT [G♯/D]–E♭–F^{5}

In the score, that sub-phrase is:

Dm–E♭m–D♭^{5}–E♭–F^{5}

In the second chord, Ligeti completes the triad in the final score as E-flat minor, rather than F-sharp major, the other possible consonant triad. In the third chord, Ligeti eliminates the dissonant tritone that resolves to the subsequent E-flat chord according to tonal convention: taking the G-sharp as A-flat, we expect a D/A-flat dyad in tonal music to resolve to a chord with E-flat and G. Why does Ligeti remove this conventional tonal progression? Perhaps he desires to minimize the potential tonal structuring with which he flirted in the sketch; or perhaps he wants to minimize the strong directed harmonic motion in this early phrase and hold it off for a later passage. Subsequent analysis will explore these possibilities. For now, it is important to note, though, that the tonally idiomatic resolution of the tritone in m. 121 (F [E-sharp] to F-sharp and B to A) and the tritone of the D-flat^{7} chord in the same bar (F to F-sharp [G-flat] and B to A—the omitted fifth of the D-major chord) are still present. Ligeti does not eliminate such progressions from the second phrase, but he does preserve less of them in the final score.

In the third phrase, eight of the twenty chords are different in the score than in the sketch—though two are only changes in quality, and another simply drops a note, changing a triad into a dyad. Most of the changes from sketch to score involve chords that, in one version or the other, involve a tritone—tritone dyads, diminished triads, and dominant-seventh chords—and these are the most interesting changes from the perspective of a search for tonal influence. Thus, in what follows, I will focus only on those changes, rather than every difference between the two versions.

Figure 4.17. Fanfare theme, phrase three (mm. 123–126), sketch version with added chord symbols. (Ostinato has been changed to score version for purposes of direct comparison.)

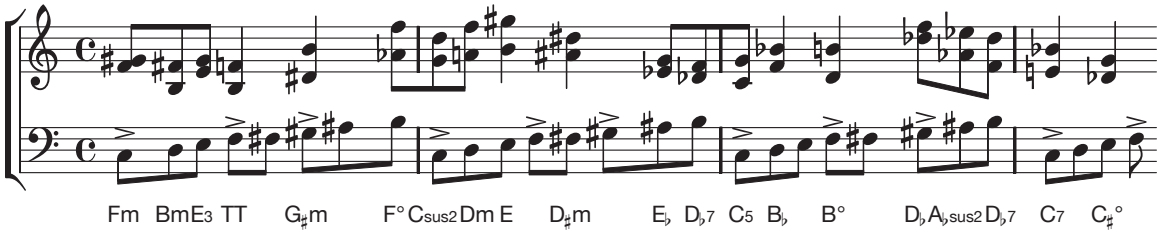
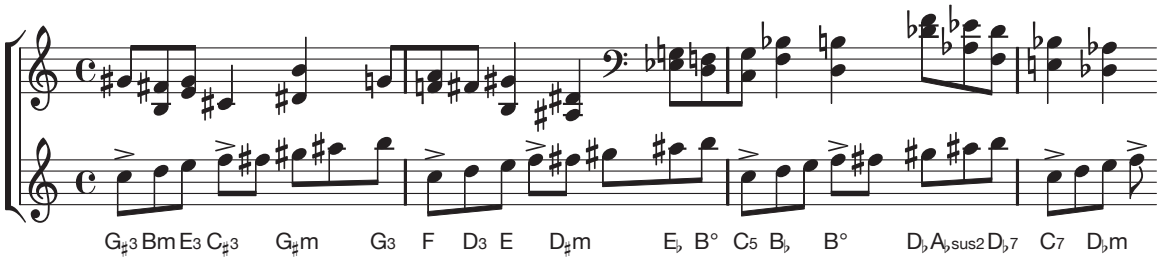


Figure 4.18. Fanfare theme, phrase three (mm. 123–126), score version with added chord symbols.



Recall that in the sketch version, phrase three (figure 4.17) contains five tritone-bearing chords, only two of which[12] resolve as we would expect them to resolve in a tonal context. Phrase three in the score (figure 4.18) contains four tritone-bearing chords: two B-diminished triads in the third sub-phrase and two dominant-seventh chords (D-flat and C)

[12] the second eighth note of sub-phrase three, if considered a respelled German-sixth chord, and the last eighth note of sub-phrase four

in the fourth sub-phrase. The first change of a tritone-bearing chord comes in the first sub-phrase, where the B/F dyad in the sketch becomes a C-sharp/F dyad in the score. That tritone dyad, no matter how it is spelled, can only resolve "tonally" with difficulty: resolving to C and E over the ground's G-sharp would create an augmented triad, a sonority Ligeti avoids absolutely in both the sketch and score. Resolving to F-sharp/A[-sharp] would be difficult given the passing F-sharp in the ostinato, which would preempt the resolution of the F-sharp, and the subsequent G-sharp in the ostinato, which would render the resolution chord a dissonant cluster. Ligeti removes this tonally problematic tritone and replaces it with a consonant ic4 dyad that participates in root progressions of descending third and ascending fifth.

The second tritone chord (F-diminished triad, first eighth note of sub-phrase two) also comes between two chords that would make typical tonal resolution of the tritone difficult, and it is also removed in the final version of this passage. Specifically the C ostinato note on the following chord makes it difficult for the F-diminished chord to resolve up by semitone to a G-flat triad. Were the tritone reinterpreted as having B as its root (B, F, A-flat then being part of a B-diminished-seventh chord, rather than a misspelled F-diminished triad), the resolution to C could be made to work—if the suspended second in the melody were replaced by the chordal third. Interestingly, Ligeti does change the chord following the diminished chord in the final score, but not in such a way to make the tritone resolve tonally; rather both chords are changed in such a way that, again, chord progress to relatively closely related chords, but without the intense tonal pull of the tritone—a major third on G (incomplete G-major or E-minor triad) moves to F major.

This trend of replacing tritones that cannot resolve tonally with triads that progress short tonal distances to subsequent chords changes with the next tritone chord of this

phrase. The second eighth note of sub-phrase three is a D-flat dominant-seventh chord, with a tritone of F/C-flat (spelled B-natural). This chord is replaced in the score by a B-diminished triad with the same B/F tritone, and both the previous and following chords are preserved in the score. Thus, the tritone that resolves tonally (in terms of its harmonic progression, not the actual voice-leading) is preserved from the sketch to the final score.[13]

The next tritone-bearing chord in the sketch, at the end of the third sub-phrase, is another B-diminished triad. Again, the tonal implications of the chord are thwarted in its resolution to D-flat major in the sketch, but this time Ligeti preserves both chords in the score. This may have to do with the relationship between B-diminished and D-flat^7 (doubling as a German-sixth chord with the seventh spelled as B-natural) already discussed—namely, the shared B[C-flat]/F tritone. The D-flat-major triad that follows the B-diminished triad is part of a clear horn-fifths motive in the non-ostinato voice: D-flat/F, A-flat/E-flat, F/D-flat. The ostinato voice fills out the D-flat-major triad on the first of those three chords, then provides a suspended second (or, rather, a ninth in a stacked-fifths chord), and finally the seventh of the D-flat^7 chord that ends the horn-fifths figure. This final D-flat^7 chord also acts much like a German-sixth chord, resolving to C^7 (Ger^6–V^7 in F minor), with the seventh spelled like an augmented sixth (B) and resolving *up* by step. (The D-flat root does progress to a C root, but not in a single voice.) Thus, the B-diminished chord and D-

[13] It is worth noting here that, though there is an unmistakable change from D-flat to D between the sketch and the score for this chord, this could be a mistake. Given that the only other change for several chords surrounding this one is the octave register, that Ligeti's published scores not infrequently contain one or two obviously incorrect accidentals, and that in the following bar a D-flat dominant-seventh chord (missing its fifth) resolves to a C chord, the engraver may simply have omitted the D-flat accidentally (no pun intended). Regardless of which chord was intended by Ligeti, both follow standard tonal progression patterns: B-diminished to C is a typical (applied/secondary) leading-tone-to-tonic progression; D-flat^7 to C is a typical German-augmented-sixth to dominant progression. (That Ligeti spells the "seventh" of D-flat as B supports this analysis, but we should not make too much of the spelling, since Ligeti holds the spelling of the ostinato pitches invariant throughout the movement, regardless of the role each pitch plays in a particular chord.)

flat^7 chord seem to work together to build expectation of a C^7 "dominant" chord to come: the B/F tritone predicts C and E, the D-to-D-flat predicts C, and the C-flat predicts B-flat. All of these chord tones arrive on the downbeat of m. 126 (though the specific voice-leading does not entirely follow these expectations, due to the constraints of the melody and ostinato).

Working against this C-as-expected-dominant interpretation is the clear D-flat-ness of the horn-fifths figure in the non-ostinato voice of m. 125, and its ultimate arrival on D-flat/A-flat at the end of the phrase in m. 126 (much stronger, and more firmly D-flat than the diminished triad at that moment in the sketch). In this line, especially when played in isolation without the ostinato voice, D-flat is the unmistakable tonic, and the E/B-flat dyad sounds grossly out of place, not the goal of the preceding dyads. However, I would argue that both the C-as-dominant and D-flat-as-tonic (or, at least, goal) functional interpretations are valid here, and working in tandem to drive the harmonic progression at the end of phrase three. C^7 as dominant in F minor can easily move to D-flat in a deceptive resolution. And though Ligeti provides us with D-flat *minor* in m. 126, the following ostinato note is F; if the E is passing to the chord tone F (something we need not strain hard to hear, in light of the strong D-flat major of the preceding bar), then the C-as-dominant interpretation is not far-fetched at all. Further, that Ligeti would incorporate chord motions that would suggest two possible competing tonics is not at all out of the question; and he unequivocally does this elsewhere, as we will see in the opening of "Alma álma."

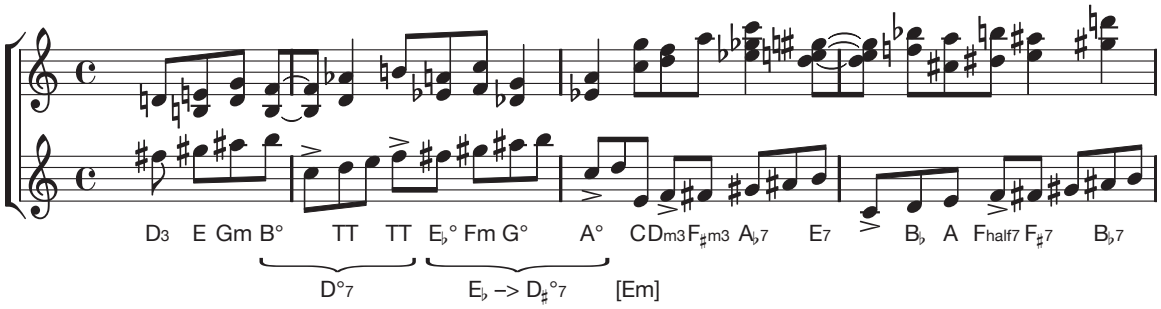
Thus, toward the end of phrase three, I find a succession of tritone-bearing chords working together to project C as a goal; that goal of C thwarted by a strong D-flat projection in the non-ostinato, horn-fifths line; and the ultimate D-flat weakened by the C^7 and the accented passing tone E. Altogether, these harmonic choices provide forward momentum, but

work against establishing any one pitch-class as a clear, unambiguous tonal center. Further, throughout the first three phrases, Ligeti eliminates tritone-bearing chords from earlier versions of the passage that do not resolve according to tonal expectations, in favor of tonally closely related motions, and he reserves the strongest tonal progressions for later in the passage, rather than near the beginning. Do these trends continue into the last phrase of this passage?

We do see an increase in the number of tritone-bearing chords in phrase four relative to the first three: phrase one has none, phrase two has two, phrase three has four, and phrase four has eleven. We also see prolongations of some of these functionally charged chords. For instance, in mm. 126–27, a B-diminished triad is followed by a D/A-flat dyad, and a B/F dyad—a drawn-out B-diminished-seventh sonority. This diminished-seventh chord resolves enharmonically, as if it were a D-diminished-seventh chord, progressing to an E-flat chord.

This E-flat chord is a diminished triad. And though it does not resolve "tonally"—to E—it moves through a double-neighbor bass pattern (E-flat, F, D-flat, E-flat) to an A-diminished triad, recapturing the same tritone in the two lower voices. We can then interpret this succession of four chords as prolonging an A-diminished-seventh chord. This triad also does not resolve tonally—to B-flat. Like the previous B-diminished-seventh chord, though, we can interpret it enharmonically as a D-sharp-diminished-seventh chord, which *almost* resolves tonally. That is, the subsequent chord contains the E and G we would expect following a D-sharp-diminished chord in a tonal context. The triad is filled out with a C rather than a B, but the two pitch-classes of the tritone at the end of this second sub-phrase resolve tonally—E-flat [D-sharp] to E, A to G.

Figure 4.19. Phrase four (mm. 126–129).



The seventh chords in the last two sub-phrases continue the pattern of introducing a tonally charged chord that resolves partially according to tonal expectations to a chord that, itself, is tonally charged. The effect is a harmonic succession that makes use of tonal expectations to generate forward momentum while avoiding a clear tonic or point of cadential arrival. For instance, the A-flat^7 chord of sub-phrase three resolves its seventh down by step to E, the root of an E^7 chord. That E^7 chord resolves to A, as tonally expected, but only after an intervening B-flat chord (that carries the seventh of the E^7 until its resolution—though temporarily moving it to a different voice). The F-half-diminished-seventh chord of m. 129 (sub-phrase four) resolves up by semitone to F-sharp with its diminished fifth resolving down by step to A-sharp, as tonally expected. However, the F-sharp chord also takes a seventh, which resolves down by step (this time in a different voice and register), again to another dominant-seventh chord.

Throughout this entire passage (mm. 116–129; the first full appearance of the fanfare theme), each phrase brings more tonally charged, tritone-bearing chords than the previous phrase. Further, the tritone-bearing chords tend to resolve their dissonances according to tonal expectations, but often only in part, or in a way that minimizes any potential for cadential effect. And as the passage progresses, there is a greater tendency for these structural dissonances to be prolonged and/or included in a chain of dissonant sonorities. The effect of all

of these properties of this passage is to generate a stronger sense of tonal propulsion as we move forward in time, while simultaneously avoiding cadences and unambiguous, long-term tonal goals.

Comparing the score to the sketch for this passage, and comparing the sketch to the automatic processes that the sketch nearly resembles, demonstrates that throughout Ligeti's compositional process, Ligeti makes changes to accomplish these purposes. That is, where the automated process would produce more dissonances and *extended tertian* chords, the sketch and score contain more triads and tritone-bearing tertian chords. And where the sketch focuses on sevenths and extended tertian chords to generate tension through dissonance in the final phrase of the passage, the final version in the score focuses on tritone-bearing chords that generate tension both through dissonance and through specific tonal expectations of resolution.

Thus, in this brief, but pivotal, passage, considerations of harmonic syntax—based on syntactic properties of tonal music—are fundamental to the passage and to Ligeti's compositional choices, even if the final result is far from typically tonal.

V. ANALYSIS – SÍPPAL, DOBBAL, NÁDIHEGEDŰVEL

V. "ALMA ÁLMA"

The fifth movement of *Síppal, dobbal, nádihegedűvel*, "Alma álma" ("Apple dream"), presents an interesting case for the study of harmonic syntax in Ligeti's late triadic works. On the large scale, the statistical properties of the root progressions in this movement suggest the least syntactic structuring of all the movements considered in this dissertation. However, a closer analysis of this movement reveals significant harmonic syntactic structures and, at times, a strong sense of key.

The statistical properties of the harmonic progressions of this movement, as analyzed in Chapter 2 of this dissertation, do not provide much hope of finding significant harmonic syntactic structure. The two primary tonic-independent properties of tonal-harmonic syntax noted in Chapter 2 are a privileging of short-distant root progressions (measured on the circle of fifths) and directional asymmetry, especially for the shortest-distance progressions. "Alma álma" possesses neither of these properties: it is the least directionally asymmetrical of the six Ligeti movements in question (its actual and reverse profiles correlate at 0.77), and its root-progression profile correlates the most negatively with the tonal corpora of all the Ligeti movements (–0.52 with the Bach corpus, –0.41 with the dC/T 200 corpus).

It was noted in Chapter 2, however, that this negative correlation with tonality could potentially demonstrate engagement with tonal practice, composing something akin to the *opposite* of standard tonal patterns on the chord-to-chord level. However, it was also noted in Chapter 2 that this movement has the highest correlation between the actual progression profile and that of a random succession of the same proportion of chord roots (0.64) of all the Ligeti movements in question. Thus, while Ligeti's root progressions may appear to be con-

sciously *anti-tonal*, that may simply be due to the chords that Ligeti has chosen to use in this movement (which may or may not be the prior decision, and which may or may not have been made with the resulting harmonic progressions in mind). Specifically, rather than privileging a set of chords whose roots occupy a contiguous region on the circle of fifths, Ligeti privileges chords whose roots occupy a contiguous region on the circle of semitones. The corollary is a privileging of close harmonic progressions on the circle of semitones (i.e., ic1 and ic2 root progressions) at the expense of the most common root progressions in tonal music (ic5).

Two questions remain, however, about the potential syntactic properties of this movement's root progressions. First, are the large-scale statistics in this movement reflective of the harmonic structures throughout the movement? Or do different parts of the form privilege different harmonies or progressions, which average out in the global profile? Second, what is the significance of the harmonies and harmonic progressions favored by Ligeti in this movement? Are these random structures? consciously anti-tonal progressions? something else? And what—if any—is the relationship between these structures and those of common-practice tonal syntactic structures?

On the first question, yes, the large-scale statistics are largely representative of the structures throughout the movement. That is to say, the root progressions are distributed fairly homogeneously—evenly, according to their probability of occurrence—and there is no passage in the music with a salient change in the probability of occurrence of any of the root-progression intervals. Thus, the large-scale statistical properties are not hiding functional behavior by averaging it out over the course of the movement.

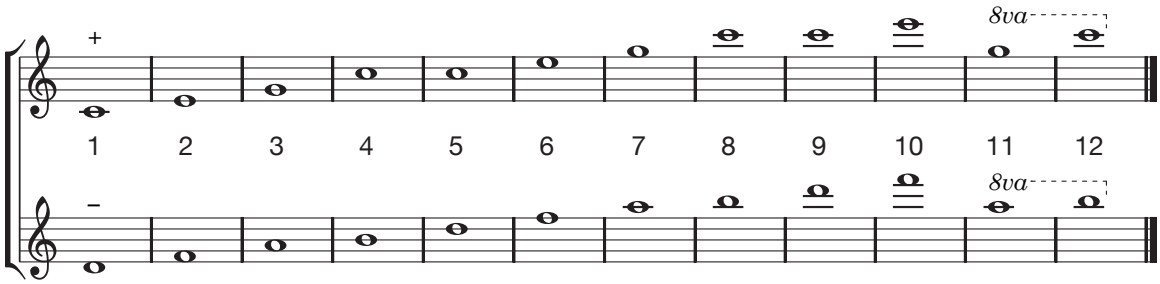
The second question, however, we must put on hold in order to consider the instrumental properties that constrain the potential linear patterns and verticalities available to

Ligeti. Understanding these constraints is fundamental to understanding Ligeti's choices and harmonic structures.

Accompanying the solo voice in this movement, the four percussionists play Hohner Chromonicas (chromatic harmonicas). Though a traditional harmonica can play only the pitches of a single diatonic collection, each individual Chromonica can play the entire chromatic collection by virtue of combining two diatonic collections a semitone apart. In this movement, the percussionists use Chromonicas in C/D-flat (2) and B-flat/B (2). This makes every pitch class accessible to each of the four players. However, Ligeti adds the compositional constraint of composing each of the four Chromonica parts in dyads. This added constraint, in conjunction with the particularities of the instruments' construction, mean that though every pitch class is accessible to each of the four players, not every combination of two to eight pitches within the ranges of the instruments is accessible.

This constraint, and the effect on the harmonic possibilities in the movement, was an important consideration in the composition of this movement; it is the topic of all the sketch material preserved for this movement (pp. 6–8 in the "Skizzen" folder of the *Síppal, dobbal, nádihegedűvel* packet at the Paul Sacher Stiftung). Following is Ligeti's chart of possible single tones for the Chromonica (and any traditional harmonica) in C. (Ligeti also sketched this chart in C-sharp, B-flat, and B-natural.)

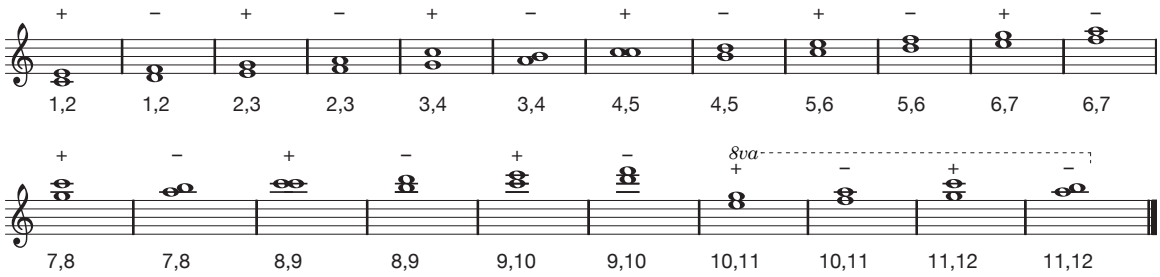
Figure 5.1. Single tones playable on the Hohner Chromonica II in C, from the *Síppal, dobbal, nádihegedűvel* sketches, p. 8. Upper staff (+), exhale; lower staff (–), inhale. Arabic numerals denote hole to blow through.



In figure 5.1, the upper staff notates pitches playable while exhaling (denoted by the "+"), with Arabic numerals indicating the hole into which the player must blow to produce the tone. The lower staff notates pitches available while inhaling through the same holes. These arpeggiate the tonic-triad and leading-tone-diminished-seventh chords familiar to anyone who has put a harmonica to mouth and indiscriminately exhaled and inhaled.

Because one can only blow into adjacent holes simultaneously, and one can only either exhale or inhale—not both—this pitch arrangement places significant constraint on the harmonic sonorities possible. For instance, only one primary triad is available to a single harmonica player for both C major (tonic) and A minor (subdominant), and though most diatonic thirds are available, it is impossible to play the dominant and the leading-tone scale degrees together in major, or the tonic and mediant in minor, on a single harmonica simultaneously. For chromatic music, the options seem even more limiting. Following is Ligeti's chart of the possible dyads available on a Chromonica (or traditional harmonica) in C. (Ligeti also sketched charts in D-flat, B-flat, and B.)

Figure 5.2. Dyads playable on the Hohner Chromonica II in C, from the *Síppal, dobbal, nádihegedűvel* sketches, pp. 6–7. Arabic numerals denote holes to blow through.



Ligeti also limits the Chromonica lines mostly to linear patterns. That is, from one chord to the next, a given Chromonica player is rarely required to move more than one hole to the left or right, unless a rest intervenes to accommodate the shift. This is likely a performance expediency (after all, these are percussionists, not professional harmonica per-

formers), which can be seen from the fact that almost all of the large leaps without an intervening rest land on a dyad played with holes 1 and 2—an easy target to find. Removing these from consideration, there is only one non-linear, non-rest progression in the Chromonica parts: m. 43—the only non-$\frac{6}{8}$ bar before the final four bars of block chords, and the bar that comes between an extended linear passage and an extended passage of disjunct Chromonica chords (*with* intervening rests). With these constraints—linear progressions and dyadic lines—in mind, we can now proceed to an analysis of the harmonic structures in this movement, exploring the above analytical question: what is the nature of Ligeti's harmonic structures, and what—if any—is the relationship between Ligeti's harmonic structures and those of traditional tonal music?

First, let's consider the large-scale statistical properties discussed in Chapter 2. The automated analysis of that chapter produced the following root-distribution profile and root-progression profile.

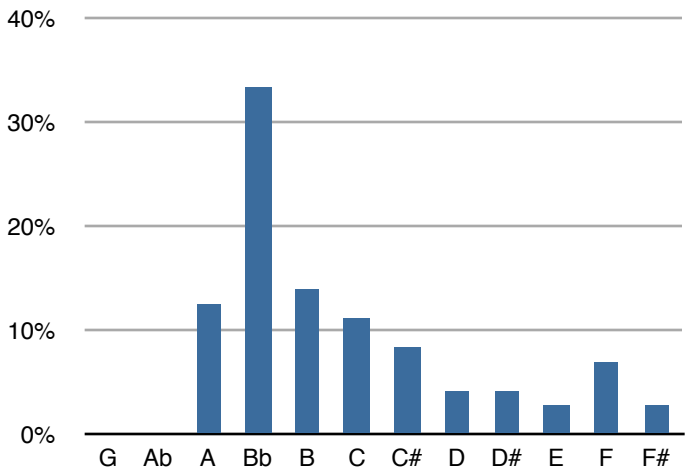


Figure 5.3. Root-distribution profile for *Síppal, dobbal, nádihegedűvel*, V. "Alma álma." Includes usual triads and seventh chords (major, minor, diminished, augmented; major, minor, dominant, diminished, half-diminished seventh).

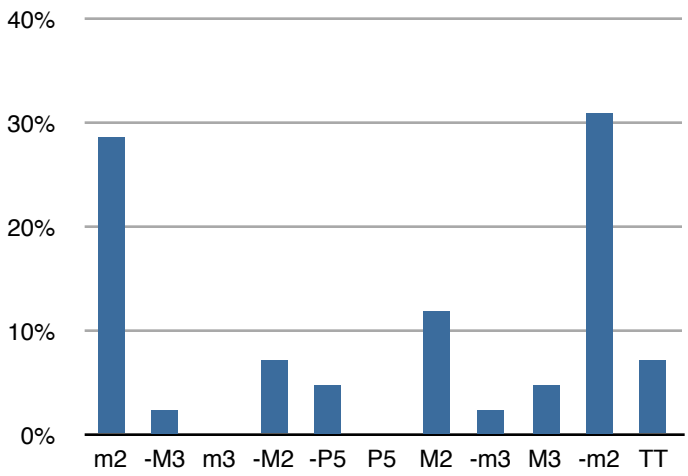


Figure 5.4. Root-progression profile for *Síppal, dobbal, nádihegedűvel*, V. "Alma álma," arranged according to distance on the circle of fifths.

As was noted above, this root-progression profile has a moderately high *negative* correlation with the profiles of the tonal corpora. This is because the chordal roots in this movement congregate around a point on the circle of semitones, not fifths (as the diatonic scale does), and the progressions between these roots likewise privilege close motions on the circle of semitones, rather than the circle of fifths. In fact, this semitone v. fifth contrast is so stark that an M-transform of this movement's root-progression profile (exchanging semitones for fifths) has a moderate to moderately high *positive* correlation with the tonal corpora (0.38 with the Bach corpus, 0.70 with the rock corpus). Following is the M-transformed root-progression profile (identical to the root-progression profile with root intervals measured on the circle of semitones). The preference for short-distance progressions on the circle of semitones can be clearly seen.

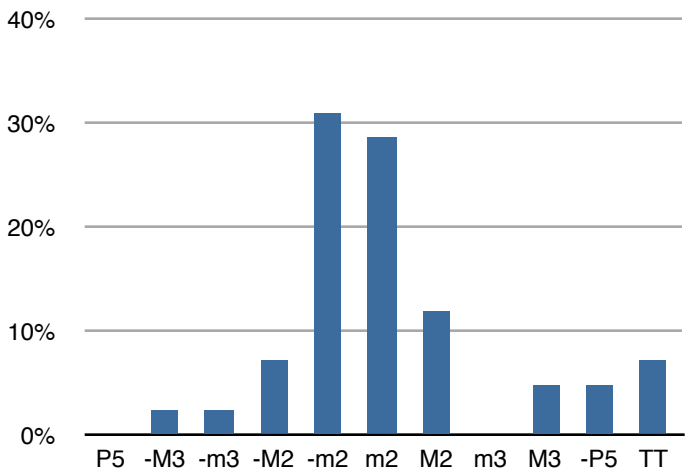
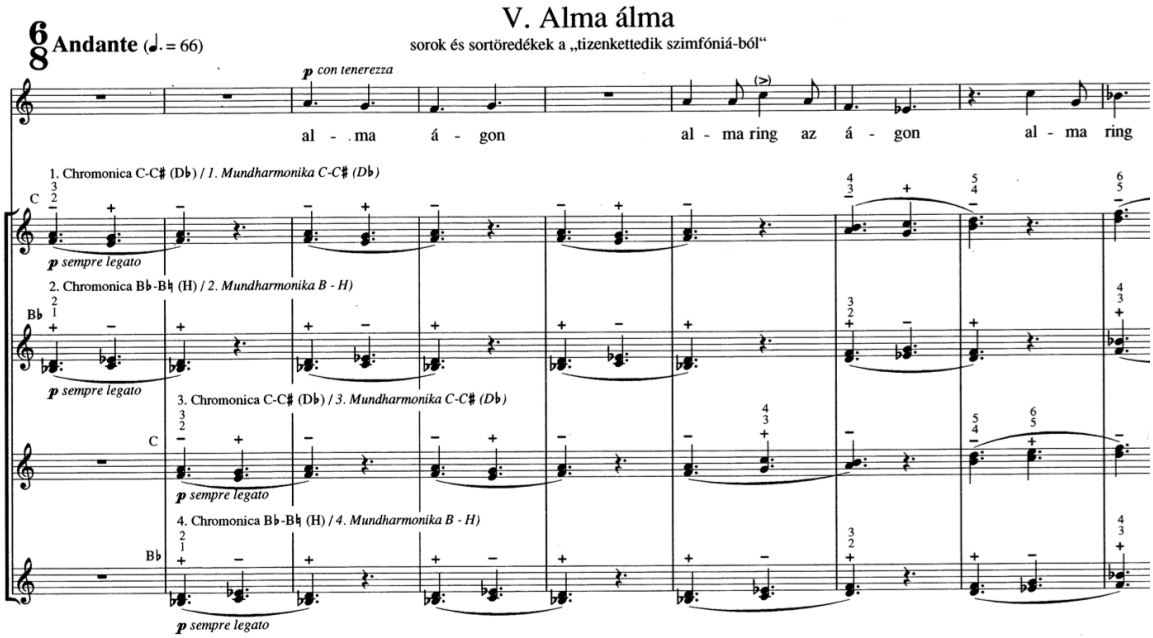


Figure 5.5. Root-progression profile for *Síppal, dobbal, nádihegedűvel*, V. "Alma álma," arranged according to distance on the circle of semitones.

These profiles were generated by an automated procedure designed to minimize situation-specific subjective judgments for the purpose of generating statistical data that could be compared directly and analogously with that of other movements. However, from the beginning of the movement, a specific and subjective analysis reveals harmonic structures that the automated procedure overlooks. Consider the opening eight bars.

Figure 5.6. Mm. 1–8 of *Síppal, dobbal, nádihegedűvel*, V. "Alma álma."



The automated procedure results in the following root progression (*x* denotes a non-tertian chord, which is left out of the root-distribution profile):

B♭ *x* B♭ *x* B♭ *x* B♭ *x* B♭ *x* B♭ C B C B *x* B♭

That root progression generates the following root-interval succession (*x* denotes a progression between at least one non-tertian chord, which is left out of the root-progression profile):

x x x x x x x x x x 2 II I II *x x*

Four root progressions are found, then, by the automated procedure in this passage. However, we can quickly see that these *x* sonorities are instances of a common chord for Ligeti (and Bartók): 0347, or the "major/minor" chord. We can, thus, take this as a chord with root C, the usual triadic fifth, and both (major and minor) triadic thirds. This would change the root progression to:

B♭ C B♭ C B♭ C B♭ C B♭ C B♭ C B C B C B♭

And that would change the root-interval succession to:

2 10 2 10 2 10 2 10 2 10 2 11 1 11 2 10

The major/minor chord is a relatively common chord in this movement (especially, but not exclusively, on C), and there are several other chord types that do not fall into the usual diatonic tertian-chord categories, but which, nonetheless, can be interpreted as having a clear root. These chords include open fifths, major or minor triads with added ninths, minor triads with major sevenths, augmented triads with major or minor sevenths, and the final chord—a sharp-ninth chord. When we consider these chords as alterations or extensions of tertian chords, with roots of their own, two things happen: we obtain new root-distribution and root-progression profiles for this movement, and the "dissonant" or non-tertian sonorities are no longer littered throughout the movement, but are largely relegated to a single part of the movement.

First, the new profiles. In these, there are two primary changes: a significant increase in sonorities whose root is C (seen in mm. 1–8, but evidenced throughout the movement), and a significant increase in the number of two-semitone progressions. These two differences are related, in that the overwhelming privileging of two roots a whole-tone apart naturally corresponds to a privileging of whole-tone root progressions. And though this marks a significant change from the original profiles, the privileging of short-distance root progressions on the circle of semitones remains the salient descriptive property of chord progressions in this movement.

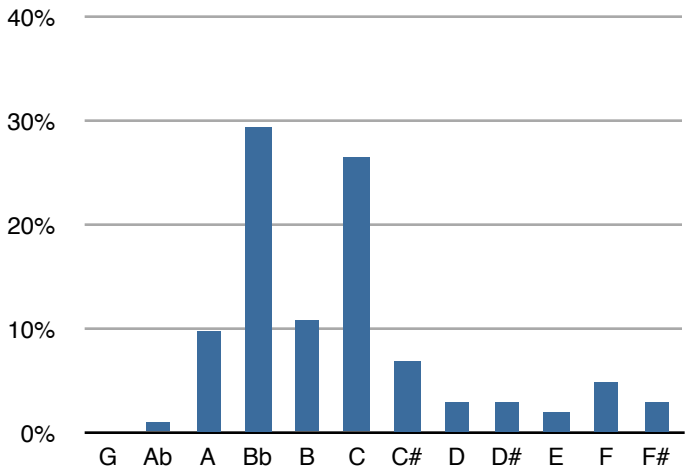


Figure 5.7. Altered root-distribution profile for *Síppal, dobbal, nádihegedűvel*, V. "Alma álma." Additionally includes dissonant chords and open fifths with clearly discernible roots.

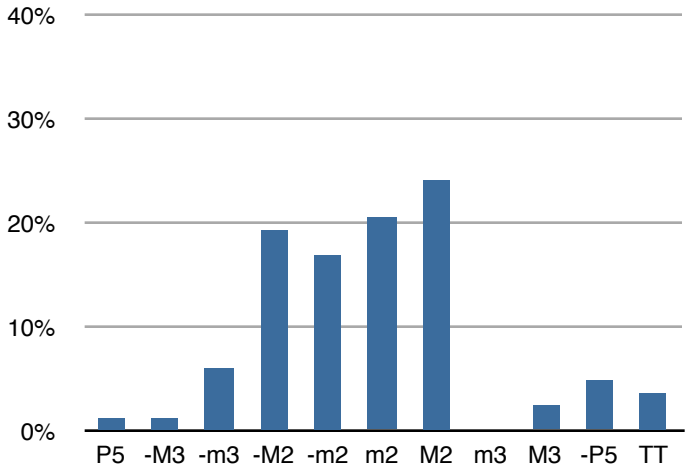


Figure 5.8. Root-progression profile for *Síppal, dobbal, nádihegedűvel*, V. "Alma álma" based on the altered root analysis (including dissonant chords with clearly discernible roots), arranged according to distance on the circle of semitones.

Second, we can consider the formal implications of Ligeti's use of non-tertian chords. When we consider the additional chords (augmented triads with a major or minor seventh, major/minor chords, etc.) as altered tertian chords, the remaining non-tertian chords are largely confined to one passage: mm. 24–35 (three bars before rehearsal B to four bars before rehearsal C). There are a few other non-tertian chords elsewhere in the movement, particularly between rehearsal D and the end, but nowhere near the amount and den-

sity in mm. 24–35. This contrast in harmonic color and density in the middle of the movement suggests the possibility of this passage of non-tertian chords functioning as a contrasting middle section in a large scale ternary form, leading into a return of material from the opening of the movement. Does such a structure pan out as other factors are considered? Almost. That is, the movement as a whole does not hold to a ternary structure, but the non-tertian passage *does* generate contrast and tension before a return of material from the opening of the movement. The following examines the formal structure of this movement in detail, considering melodic motive, melodic pitch-class collection, harmonic density, and potential tonicization of certain pitch classes.

Let's consider chordal structures first. The movement begins, as noted above, with an alternation of two harmonies, a B-flat-major-seventh chord and a C-major/minor chord. Between the first bar and rehearsal A (m. 13), every bar except for two have a B-flat chord on the downbeat. This suggests the possibility of B-flat as a tonic. Rehearsal A brings more variety of harmonic choices, though still predominately based on roots of A, B-flat, B, and C (the four most common roots throughout the movement). Three bars before rehearsal B marks the beginning of the passage dominated by non-tertian (i.e., significantly dissonant) chords. Rehearsal B sees a doubled pace in the harmonic rhythm (four chords per bar), and after two bars of dyads and triads, returns to mainly non-tertian chords. Five bars after rehearsal B brings a further increase in the speed of the harmonic rhythm (six chords per bar) and chordal density (three or four Chromonica dyads simultaneously, rather than one or two). This pattern of increasing tension releases in m. 36 with four bars of block chords, one per bar. These chords are once again tertian: A minor, D-flat major, B major, and C augmented with a minor seventh. These block chords are a highly marked phenomenon in the form of the movement: the harmonic rhythm changes from its fastest tempo to its slowest, the harmonic

density drops from an eight-voice dissonant chord to a four-voice consonant triad, and the first two chords are hexatonic poles of each other—a salient chord relationship in late-Romantic music, and a significant focus in some of Richard Cohn's analytical work on music of that time period (c.f., Cohn 1996, 1998, 1999, 2004, 2007).

After these four chords, rehearsal C brings a return of the opening harmonic pattern—alternating B-flat sonorities (major-seventh chords and D/F dyads) with C-major/minor chords—this time at the medium harmonic rhythm of rehearsal B. After just a few bars of this recapitulation of sorts, the first metric change of the movement (m. 43, in 8/8) ushers in the most harmonically heterogeneous section of the movement (which includes the most variegated mix of roots and of tertian/non-tertian chords), a section that also has significant variety in the pacing of its harmonic rhythm and that moves gradually from the lower to upper register of the Chromonicas. The last four bars bring a second progression of slow block chords: F major, F half-diminished seventh, B-flat augmented, C minor with a major seventh, A major with an added ninth, and finally B-flat dominant-seventh with a sharp ninth.

The harmonic structures outlined here suggest a large-scale binary division of the movement. The beginning establishes a stable pattern which liquidates and builds in tension until the four block chords at m. 36; rehearsal C returns to an altered version of the original stable pattern which builds in tension until block chords at the end of the movement. Further, B-flat—aside from being the most common root in the movement—is the primary harmonic root of the opening pattern (where it is prolonged by a neighboring C-major/minor chord), the altered version of its return (where it is prolonged by a passing C-major/minor chord), and the final chord of the movement. Do melodic considerations support such a binary-form-in-B-flat analysis of the movement?

Yes . . . and no. The melody clearly supports a binary-form structure, with a return of sorts at rehearsal C. This can be seen in the melody's increase in rhythmic speed and chromatic density after the opening twelve bars, as well as the increase in chromatic density and the descent to an extreme lower register after rehearsal C (though it returns to a middle register before the end). It can be seen even more clearly in the way that the motivic material of the melody punctuates each of the two sections of the binary form. In each case, the melody ends with a motive unique in the movement: a semitone descent over two long tones. The first half of the movement ends with three occurrences of this motive: B-flat to A in mm. 31–32, B-flat to A in mm. 34–35, and A to A-flat in mm. 36–37 (over the two chords of the hexatonic-pole progression). The movement ends with a repeat of this motive on A-sharp (B-flat) to A-natural in mm. 55–56, with the A arriving on the first of the final succession of block chords. Thus, the melody confirms the binary formal structure, punctuated by the block-chord passages preceding rehearsal C and the end of the movement.

However, the melody contradicts the potential tonic function of B-flat. In spite of the fact that for the first twelve bars the melody is contained in the B-flat-major collection, B-flat is not the functional tonic of the opening melody; rather, the melody expresses F mixolydian. Not only does B-flat not appear in the melody until m. 9, but the opening phrase of the melody begins with mi–re–do in F, and the second phrase features a prominent arpeggiation of an F-major triad. Further, though the movement ends on a B-flat-sharp-ninth chord, the melody ends with the resolution of its descending-semitone motive on an F-major chord. Thus, the melody works against the potential tonicity of B-flat.

In spite of the F-ness of the melody at the opening and close of the movement, B-flat seems the stronger candidate for tonic in this movement. The Chromonicas have both the first and the last word in the movement, and in each half of the binary form. Further, the

identity relationship between the F-mixolydian collection and the B-flat-major collection minimize the unsettling effect that the melody can have on the potential tonic status of B-flat. That said, there is a real tension between the two, which is an integral part of the tonal structure of the movement.

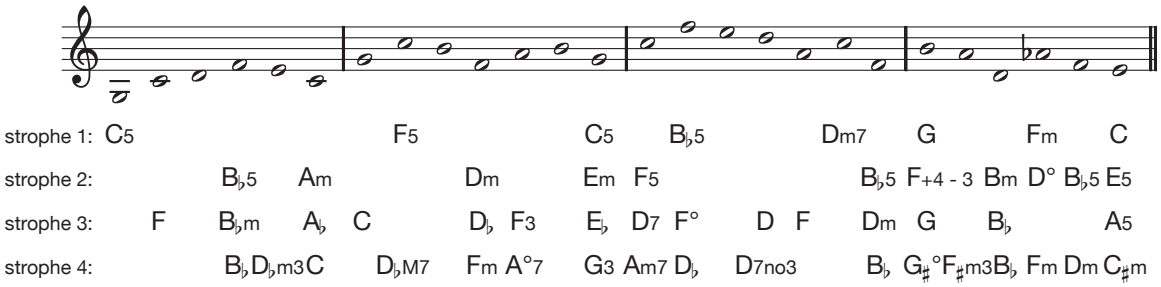
What is most interesting for this dissertation, however, is that there is nothing to suggest the possibility that this movement has *no* tonal center. The significant presence of triads and other tertian sonorities, the use of non-tertian harmonies only in passages of elevated tension, and the recurrence of specific chords and chordal roots—namely B-flat (major-seventh) and C (major/minor)—at key points in the form all suggest tonal-harmonic structuring, even if that structuring is not wholly consistent with historic tonal practice. Further, the clear privileging of specific harmonies (specifically at the openings of the two main formal sections) and the privileging of specific root-to-root intervals (specifically at the openings of the two main formal sections) suggest that the chords and progressions Ligeti favors in this movement participate in a harmonic-syntactic system, with the most common chordal roots (B-flat and C) and the most common root intervals (ic1 and ic2) functioning as elements of harmonic stability and contributing significantly to the overall sense of stability and "home" at the openings of the two halves of this binary movement.

VI. "KESERÉDES"

"Keserédes" ("Bittersweet") is a strophic song. A melody, almost completely confined to the white-key diatonic collection, is sung four times, with slight difference in rhythm and figuration each time. Each strophe sets a couplet of an eight-line poem. The harmonic setting of this melody is different for each strophe, gradually increasing in complexity until the end of the last strophe and the subsequent three-chord bird call played on the ocarinas before proceeding to the final movement, "Szajkó" ("Parakeet"). This general formal and harmonic structure is readily heard, and thus I will not spend a great deal of time with this movement. However, this movement demonstrates in a very straightforward way Ligeti's use of specific harmonies and chord-to-chord progressions in a functional way, reminiscent of tonal syntax, that is essential to the form of the movement. Thus, it is worth looking at this movement in some detail to see those harmonic-syntactic structures at work in this movement.

This movement contains four clearly delineated strophes. The melody for these strophes (which constitutes the only material for this movement preserved in the Ligeti Collection at the Paul Sacher Stiftung) remains almost entirely unchanged from strophe to strophe; it is the drastic differences in its harmonization between strophes that provides the interesting pitch elements in this movement. There are three ways in which the strophes are differentiated from each other harmonically. First, where there are more melodic notes than chord changes, Ligeti often varies the melodic notes with which harmonies are articulated; for instance, the first chord of each strophe enters with the first, fourth, second, and fourth notes of the melody, respectively (see figure 5.9). There is little to this property, except to offer variety, and to enable a greater diversity of consonant harmonic possibilities between the strophes.

Figure 5.9. Melody of "Keserédes" with harmonic accompaniment for each strophe. Single barlines denote melodic phrase divisions.



Second, Ligeti explores—at times, almost systematically—the various possible consonant harmonies of certain notes in the melody. This is especially the case at moments of cadential arrival. As figure 5.9 shows, the first phrase of the melody ends on a C, which is harmonized in turn by a C^5 chord, an A-minor chord, an A-flat-major chord, and a C-major chord; it sits as the root, minor third, major third, and (again) root of these chords. The second and fourth "cadences" (again, used loosely to refer to the final melodic/harmonic arrival of each melodic phrase) see a greater diversity of harmonization. Both tones—the G of phrase 2 and the E of phrase 4—function as root, fifth, major third, and minor third in one of the strophes. The third phrase—with the least sense of arrival out of the four—has the least diversity of harmonization, but Ligeti does explore multiple options (never making the melodic F the chordal root).

Lastly, and most significantly when considering syntax and form, Ligeti increases the harmonic tension of each strophe through an increase of chordal complexity, an increase in average harmonic distance (measured as steps on the circle of fifths) in the root-to-root motions, and the establishment of a "home" harmonic region and subsequent movement away from that region.

Let's first consider the increase in chordal complexity throughout the movement. The first strophe contains perfect fifths and consonant triads almost exclusively, with a slight

preference for open-fifth dyads, which also are exclusively used for the first two and a half phrases. The second strophe sees an increase in the pace of the harmonic rhythm—and, thus, the total number of chords—and an increase in the proportion of triads to open fifths. It also sees the introduction of two dissonant sonorities—a diminished triad and a suspended raised-fourth chord. The third strophe further increases the harmonic rhythm's pace and the total number of chords, it all but eliminates the open-fifth chord, and it introduces the third dyad (more tonally ambiguous than the open fifth from a root-analysis perspective) and the seventh chord. The final strophe sees one last increase in the total number of chords, the elimination of the open-fifth sonority, and several more seventh chords. This increase in both horizontal and vertical density over the course of the movement contributes to a clear rise in tension throughout the movement.

The changes in the types of harmonic motions from strophe to strophe also contributes to this rise in tension from strophe to strophe. The root-interval probability profiles for each of the individual strophes (figures 5.10 through 5.13) show a demonstrable preference for close root motions on the circle of fifths in the first strophe, followed by a mixture of close and distant progressions in the second strophe, a preference for medium-distance progressions in the third strophe (largely an emphasis on the root intervals used least in strophe 2), and finally a profile for the fourth strophe that is quite nearly the opposite of that of the first strophe. (We can also note that all three descending-major-second progressions of the fourth strophe involve a diminished triad/seventh chord and/or a third dyad, rendering those relatively close-distance root motions anything but stable or typically tonal.)

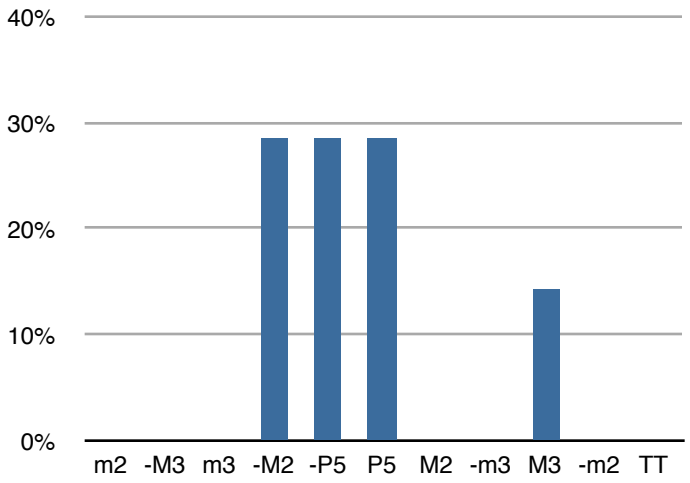


Figure 5.10. Root-interval probability profile for "Keserédes," strophe 1, arranged according to distance on the circle of fifths.

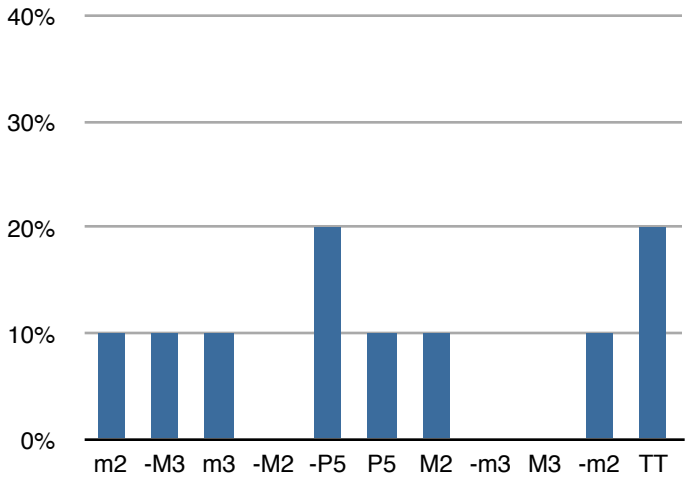


Figure 5.11. Root-interval probability profile for "Keserédes," strophe 2.

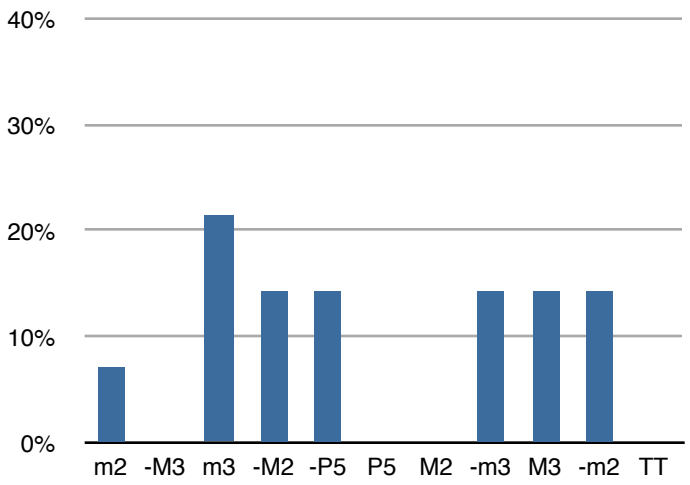


Figure 5.12. Root-interval probability profile for "Keserédes," strophe 3.

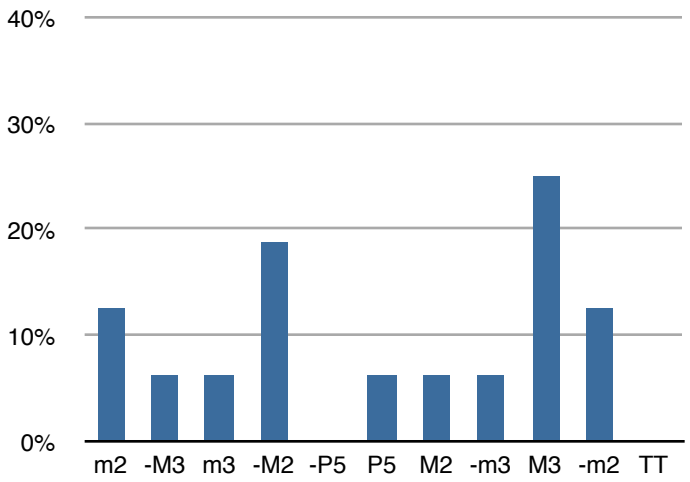


Figure 5.13. Root-interval probability profile for "Keserédes," strophe 4.

Finally, there are differences in the harmonic content of the four strophes that contribute to this general rise in harmonic tension throughout the movement. Figures 5.14 through 5.17 provide the chord-root probability profiles for the four strophes. From these we can see that the primarily white-key melody is harmonized by primarily white-key chords in the first strophe: the five roots used form a bell-shaped distribution on the circle of fifths, centered around C. Further, three of the four phrases of the first strophe end on a chord with C as its root, and the third phrase ends on D minor-seventh (II^7 in C). The second stro-

phe avoids C and G roots, and contains many chords outside the white-key diatonic collection. In contrast with the first strophe, only 64% of its chordal roots are within two circle-of-fifths steps of C. 73% of the chords of strophe 3 are within two steps of C—a slight increase—but we also see a greater diversity in the chord-root content, as this strophe contains 9 different chordal roots. The fourth strophe is the most distant from the home harmonic region of the first strophe, with only 53% of its roots within two steps of C, and with the plurality of chords built on a root of D-flat/C-sharp (the final harmony of the strophe). We also see a gradual move away from the first strophe's home region of C major—or, rather, the white-key collection with a plurality of roots, and starting and ending roots, on C—in the cadences at the end of each strophe. Strophe 1 ends on C, followed by different but closely related chordal roots of E and A in strophes 2 and 3, and finally by the very distant harmonic cadence on C-sharp.

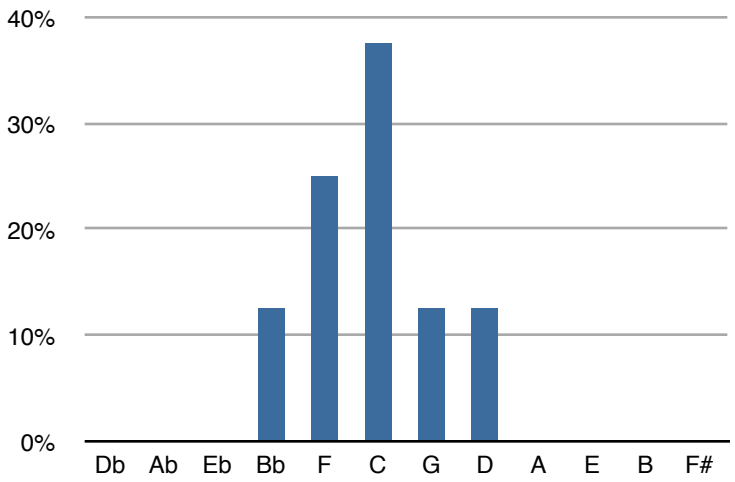


Figure 5.14. Chord-root probability profile for "Keserédes," strophe 1.

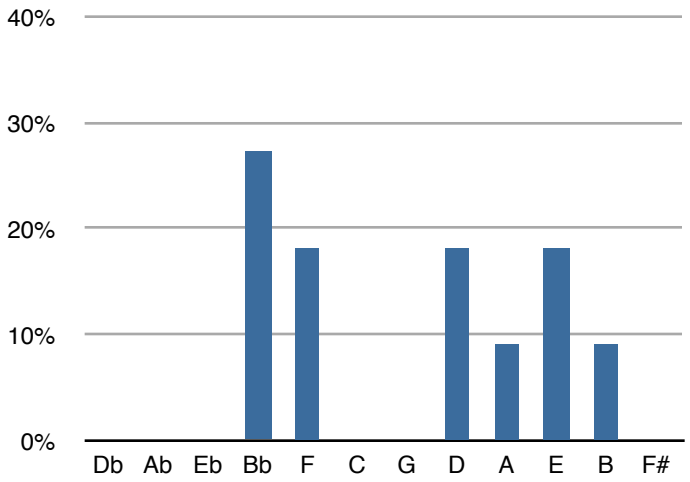


Figure 5.15. Chord-root probability profile for "Keserédes," strophe 2.

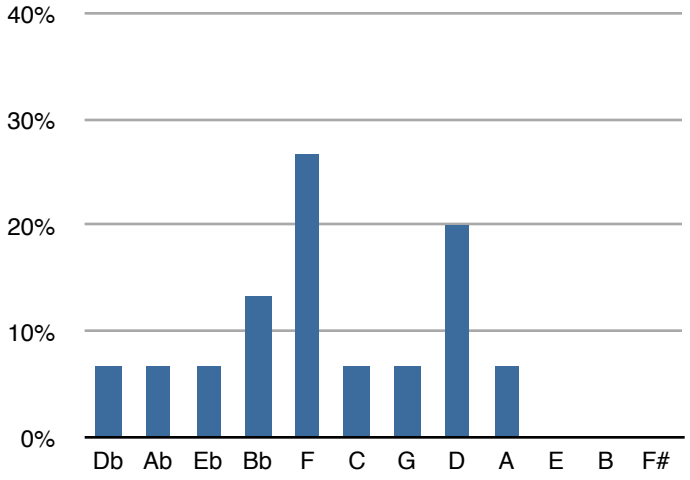


Figure 5.16. Chord-root probability profile for "Keserédes," strophe 3.

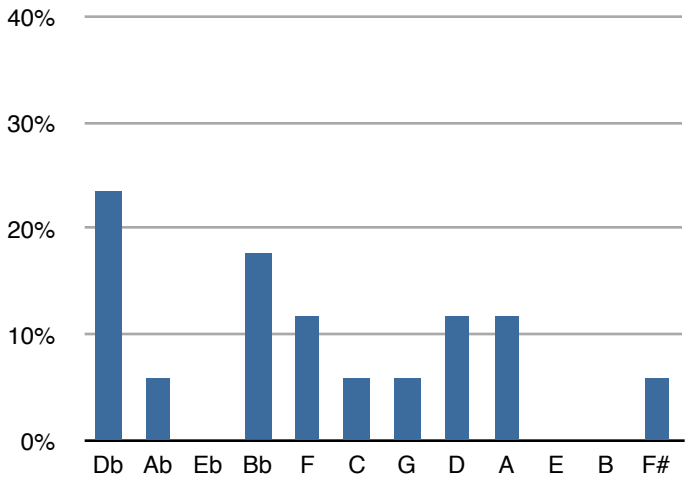


Figure 5.17. Chord-root probability profile for "Keserédes," strophe 4.

This gradual building of harmonic tension throughout the movement, and the gradual movement away from home, work together with the stasis of the melody in service of the text and the general mood of the song. The title, "Bittersweet," on its own invites the juxtaposition of contradictory moods in order to portray this complex emotional state. The text of the poem also invites a musical setting that juxtaposes a stable home with something distant and tense. It is full of contrasts between fantasy and reality and ends with an ambiguous reference to the marriage of the narrator. Though we might be tempted to look on his marriage as a positive end to the poem and to the monotony of his daily life, Weores gives us clues that it is the marriage that is bittersweet. First, the imminent wedding is put in the place of contrast with the narrator's dream of "a hundred blossoming roses," with the dream in the place of the fantasy, and the wedding in the place of disappointing reality. Further, the counting of the cuckoo calls and the "Heigh-ho" that opens the final line lead us to interpret this wedding as part of the humdrum routine of life. And lastly, the narrator writes "they are taking me to be wed to my sweetheart." This smacks not of eager anticipation but of resignation to the fate that awaits him.

"Bittersweet" (67th Magyar Étude)
I plowed, I plowed with seven fiery dragons,
Heigh-ho, I sowed nothing but lilies of the valley.
I plowed, I plowed with a beautiful diamond plow,
Heigh-ho, everywhere I sowed my tears.
In the forest, I dreamed of a hundred blossoming roses,
Heigh-ho, I slept no longer, was half awake,
In the early morning I got up, counted the cuckoo calls,
Heigh-ho, they are taking me to be wed to my sweetheart.

Figure 5.18. English translation of text to "Keserédes" (tr. Sharon Krebs 2002).

The sentiments expressed in this poem are clearly evident in Ligeti's musical setting. The routine of daily life is portrayed by the static repetition of the melody in the movement's strophic form. The unchanging reality is portrayed by the inability of the melody to leave the home in which it is set. The contrasting fantasies are represented by the harmonic world, which is diverse and active, but which is ultimately bound to the stasis of the melody. Finally, just as the strophes cease to repeat when the final note of the melody has been harmonized in all of its triadic roles (major third, root, fifth, minor third), the narrator—his fantasies exhausted and unfulfilled—arises and submits to his fate. At this point, the cuckoo (ocarina ensemble) sounds, leading the narrator to his "sweetheart" and us listeners to the cuckoo's friend, the parakeet (movement VII.).

In this movement, it is clear that the harmonies and harmonic progressions that Ligeti uses follow a logic that is critical to the form and the text-music relationship. Further, it is clear that the specific harmonic-formal structures in this movement are dependent on their relationship to tonal syntax. In the first strophe, Ligeti uses a primarily diatonic collection of pitches, chords tightly grouped on the circle of fifths, close circle-of-fifths root motions, and repeated emphasis of the root C at the ends of phrases. All of these harmonic features activate our tonal expectations as listeners and establish a harmonic region we readily perceive as home. As the strophes repeat, Ligeti pulls us further and further from that harmonic

home—both in pitch content and in the types of harmonic progressions we hear. Thus, in this movement, both the home region surrounding C and the close circle-of-fifths progressions possess a functional role of stability generation. As the music moves farther away from these stable-functioning sonorities and progressions, there is an increase in harmonic-syntactic tension that is in service of both the formal trajectory of the movement and the text that it sets. It is clear, then, that in this movement, Ligeti's harmonic structures fulfill both criteria of a syntactic system—norms for ordering harmonies, and categorical differentiation of function in terms of stability and instability—and this syntax is integral to the form and meaning of the movement.

VII. "SZAJKÓ"

The definitions discussed earlier in this dissertation provide two criteria for a musical syntactic system: rules for ordering elements into sequences and discernible categories of stability and instability, or mobility and closure. Both of these properties are present in the harmonic successions in the final movement of *Síppal, dobbal, nádihegedűvel*, "Szajkó" ("Parakeet").

The rules for combining chords into successions are very simple in this movement. Almost exclusively, chordal roots progress by ascending step in pitch-class space; the precise interval (i1 or i2) is determined by a controlling scalar collection that governs the bass line of a passage. The controlling collection is typically a diatonic, acoustic, whole-tone, or chromatic collection, sometimes with a small alteration (usually an added note). Each pass of the bass/root line through the octave follows the path of ascending steps through one of these collections, more or less. In passages where the specific collection is firmly established, then, the root following a given chord can be easily predicted (the quality of that chord is not always so clear). In passages where the controlling collection changes frequently, the pitch class of the forthcoming chordal root may be difficult to predict, but the listener is largely safe to predict that it will be a major or minor second above the pitch class of the chord sounding at that moment.

There are a few exceptions to this pattern. First, there are four points in the music (three within the first ten bars, one later in the movement) where the bass line follows this pattern, but the root progression (as evaluated according to the automated procedures described in Chapter 2 for this movement) does not. In other words, the chord changes without the bass moving. In m. 4, for instance, the B-flat bass note is accompanied by an F in the upper voice—a perfect fifth—but on the last eighth-note of the bar, a C is added to the

chord. The automated procedure renders the B-flat/F/C chord a dissonant chord, since it is looking for triads, seventh chords, and incomplete triads or seventh chords. However, we can easily consider this a variation of a B-flat sonority (stacked fifths, an incomplete ninth-chord, or a "sus2" chord). Since this B-flat chord is followed by a C chord, we need no longer consider it a break in pattern; it is simply a B-flat^{sus2} chord where the suspended second enters an eighth-note later than the root and fifth.

The other three breaks in the pattern are nearly identical to each other, and they can also be interpreted as variations on the established pattern, rather than true breaks in the pattern of basses/roots ascending by step. These three variations can be found in mm. 2–3 (over the E–F bass progression), 8–9 (over the A–B-flat bass progression), and 46–47 (over the D–B-flat–E-flat bass progression). In each case, a semitone ascent (E–F, A–B-flat, D–E-flat) is expanded into a major-third descent and a perfect-fifth descent (or, i1 becomes i8 followed by i5); only in the latter case, though, does the intervening chord's root find its way to the bass voice. This step-becomes-third-followed-by-fifth pattern is, of course, familiar to tonal theorists: Rameau's *double emploi* reinterpretation of the ascending step from IV to V in a tonal cadence as a IV–II–V progression in the *basse fondamentale* similarly reconsiders a forbidden (by his theory) step in the root progression as a third followed by a fifth. The difference in "Szajkó" is that Ligeti expands a semitone ascent, rather than a whole-tone ascent, and that Ligeti's chords actually change according to this pattern, rather than merely being reinterpreted or analyzed according to this pattern. In fact, I am doing the reverse of Rameau: interpreting an unexpected third–fifth root progression as a substitute for a more common (and more syntactically appropriate, in this movement) ascending step progression. In any case, these three progressions, along with the sus2 "dissonant" chord, can be easily interpreted as expansions of the established pattern, rather than breaks in it. In fact, they are only

exceptional in light of the automated process used in Chapter 2. Were we to begin with a manual analysis, these progressions would likely pose no issue.

There is one other break in the established pattern of root ascent by step, and this one is structurally significant. Mm. 24–28 see a near disappearance of the established pattern, as the chordal roots progress

C–D–E-flat–D-flat–A-flat–B-flat–F–G-flat–D-flat–D–A–B-flat . . .

and then return to ascending scalar patterns. More will be said about this passage later, in the discussion of the large-scale formal structure of the movement. However, for now, it is worth noting some things about the intervallic structure of this succession. First, this passage is an example not simply of a break in the pattern of ascending steps, but a fragmentation of the pattern. After leaping to its upper-register starting point on the D-flat root of m. 25, this succession is essentially a harmonic sequence, composed of ascending steps, each a third lower than the previous ascending-step pattern:

C–D–E-flat–D-flat–[A-flat–B-flat]–[F–G-flat]–[D-flat–D]–[A–B-flat] . . .

Fragmentation of a pattern is often a marker of a coming cadential or otherwise structurally significant event in the form, and that is what happens here. The established pattern of ascending steps fragments in this passage, and then resumes in a guise unique in this movement (the ascending three-octave chromatic line in mm. 28–41), which leads to the movement's climax, a mid-movement structural cadence that introduces a not-quite return to the opening pattern. Again, more will be said about this passage in the context of a more substantial discussion of the movement's form. It suffices for now to note that this single significant break of the established root-ascends-by-step pattern does so in the service of a particular formal goal. Outside of this passage and the handful of trivial examples noted previously, every root progression is an ascending i1 or i2. Thus, we can safely say that there

are not only privileged progressions in this movement, statistically speaking, but that there are clear rules and expectations governing all of the root-to-root progressions, and that there is discernible meaning in the breaking of those rules/expectations.

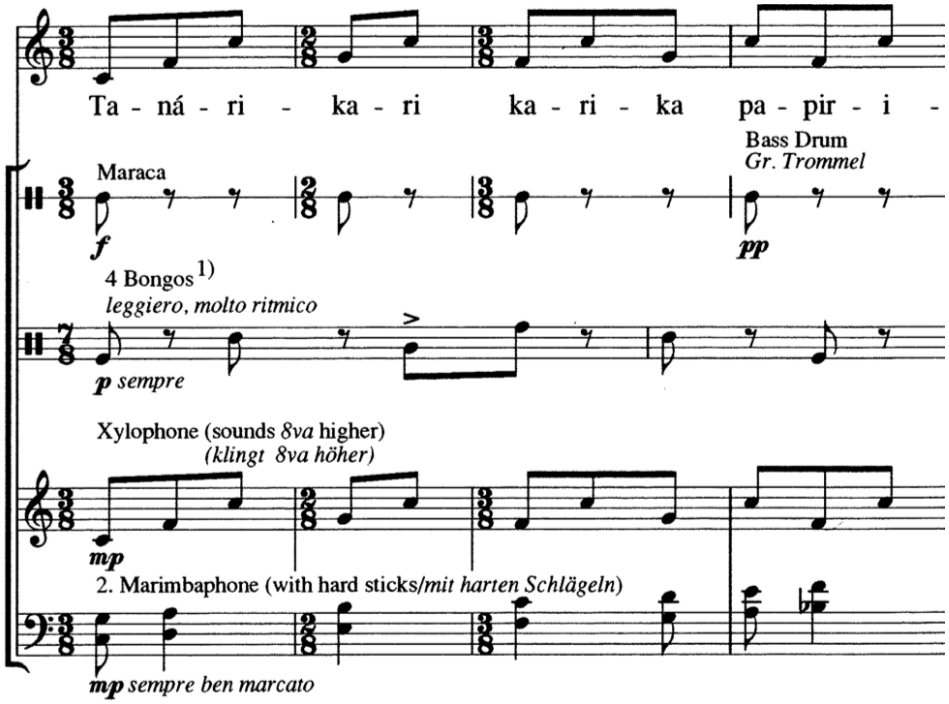
The syntactic criterion of possessing discrete categories of stability and instability, or mobility and closure, can be expressed harmonically in two ways. First, certain harmonic sonorities can be categorized as stable and others as unstable (in tonal music, these sonorities are defined either by their absolute pitch content or by their scale-degree content relative to a local or global tonic). Second, harmonic progressions can be categorized as stable or unstable. In tonal music, these two methods of categorization converge: the most stable harmony is one that comprises the local and global tonic, and which follows a descending-fifth root progression (or an analogous substitute progression)—a I chord that follows a $V^{(7)}$ chord, in the home key.

In "Szajkó," the succession of root progressions leaves little room for differentiation between types of harmonic progressions according to their contributions toward harmonic stability or instability. There are moments—such as the aforementioned fragmentation passage of mm. 24–28, the three-octave chromatic ascent, and some brief moments where a whole-tone collection controls the root succession—where the usual pattern of mixing ascending tones and semitones breaks, producing tension or instability. In the majority of this movement, though, where a mixture of i1 and i2 abounds, we cannot differentiate those two progressions into two discrete categories with one promoting the perception of stability, the other instability.

However, in the opening bars of the movement, Ligeti establishes a repeated pattern in the succession of harmonic roots that puts forward several candidates as contributors to a sense of stability, which could be used to articulate points of closure within the form of the

movement. As mentioned above, the precise intervals found in the bass/root progression at any given moment are determined by a locally controlling scalar collection. Generally speaking, these are diatonic, acoustic, whole-tone, or chromatic collections. In the beginning of the movement, Ligeti establishes the pattern and the means by which we can segment each iteration of the pattern through the five-fold repetition of a single pattern, provided in the figure below.

Figure 5.19. *Síppal, dobbal, nádihegedűvel*, VII., mm. 1–4.



Though the rhythm is different each time, Ligeti provides five iterations of an ascending C-mixolydian scale, entirely in octave 3. This pattern dominates almost the entire first third of the movement (opening through reh. A), and the static components of this repeated pattern generate a sense of expectedness and, thus, stability. The static components of this pattern are the C-mixolydian pitch-class collection, the octave-3 register, the scalar ascent from C to B-flat (and the seventh leap from B-flat to C), the privileged position of C as the first and

lowest member of the scale, the use of the same collection for the bass scale and the pitch content of the upper voices, and the harmonization of each chord by a root-position triad or open fifth (with the off-beat exceptions noted above).

As we look in detail at the form of this movement, we begin to see that some of these elements that make up the stable opening of the movement's root progression take on functional roles. That is, we can see Ligeti actively using the presence and absence, completeness and incompleteness, of some of these elements to contribute to an overall sense of stability or instability as the form of the movement progresses. This, in turn, is fundamental to the articulation of a large-scale formal structure.

First, there is one element that we can rule out as bearing functional significance, an element that exhibits stasis rather than patterns of expectation and fulfillment/denial. That is the use of root-position triads or open fifths above the bass note. As a rule (with a few exceptions, noted above), every bass note is the root of a triad or the lower note of an open-fifth sonority. Thus, like the i1 and i2 bass-progression intervals, this is a static pattern that does not bear functional differentiation in the movement, and thus does not bear syntactic structure.

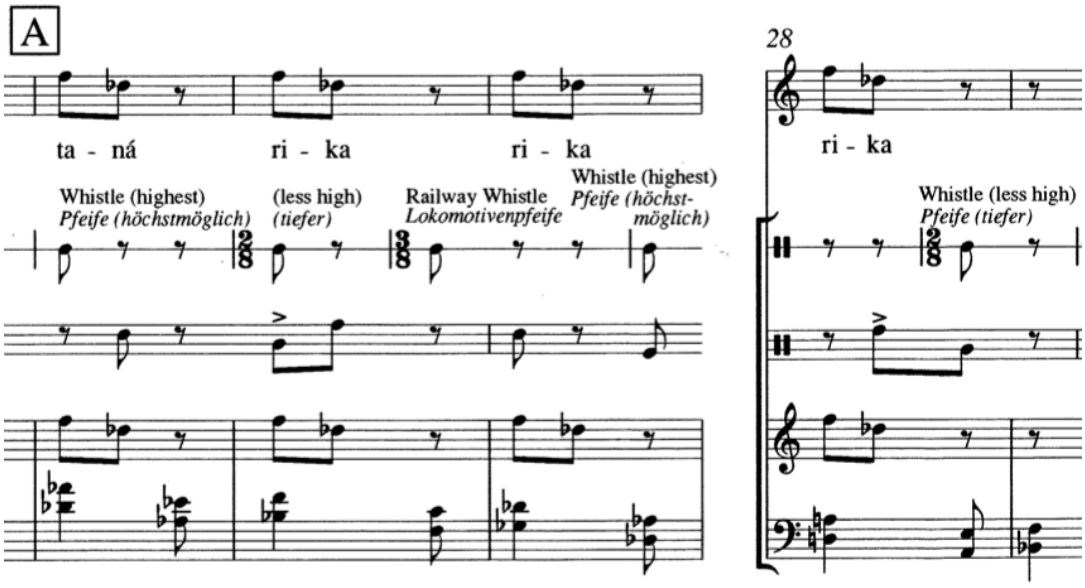
The rest of the elements of the opening bass/harmony pattern, however, do take on a functional-syntactic role; that is, they participate in systems of expectation that articulate moments of stability and instability. Together, all of these elements contribute to the articulation of a large-scale formal structure through their respective stability/instability, mobility/closure profiles.

Perhaps the simplest of these elements in its projection of stability and instability is the register of the bass. The bass line in mm. 1–22 never strays from the absolute-pitch space between C3 and B-flat3. At rehearsal A, Ligeti stretches the upper boundary ever so slightly

with the appearance of D-flat4 in the bass, but it is not until the three-octave chromatic ascent that begins in m. 29 that Ligeti breaks the octave-3-more-or-less expectation to a significant degree. At m. 34, the bass line leaves octave 3 and ascends to an A5 (by far the highest bass note of the movement) at m. 41. M. 42 (reh. B) follows with a return to the original register (more-or-less, as Ligeti uses B-flat2 to A-flat3, a whole-tone lower than the opening), which contains the bass line for the remainder of the movement. In this parameter, then, there is a breakdown of the original pattern at rehearsal A, progressing to a height of instability in m. 41, and a return to the original point of stability at rehearsal B that holds for the remainder of the movement.

The scalar ascent pattern of the bass line is also fairly straightforward in this movement. Though the exact pattern of intervals changes throughout the movement (which will be discussed shortly), the pattern of progressing up by scalar steps (semitones or whole-tones) and leaping down a large interval to begin the subsequent scale holds throughout almost the entire movement. There is one point at which the scalar ascent pattern breaks down: rehearsal A (noted above).

Figure 5.20. *Síppal, dobbal, nádihegedűvel*, VII., mm. 25–28.



Though brief, the four bars beginning at rehearsal A provide a noticeable break from the pattern of ascending scalar motion. Interestingly, the ascending-step motive is still present, as the last eighth note of each bar progresses up by step to the downbeat of the following bar. This presents us not simply with an absence of the established pattern, but a fragmentation of the established pattern. The fragmentation of the octave-spanning scales is followed by what we might characterize as a super-scale—a three-octave ascent of semitones, the semitone being in one sense the quintessential step interval, as it is as far from a leap as one can get in the chromatic system. This super-scale breaks off at m. 41, which we noted receives emphasis from the extremity of the bass's register, and then the original ascending-scale (mixing i1 and i2) pattern returns at rehearsal B and remains for the duration of the movement.

We can see in this parameter a similar stability/instability profile to that projected by the bass register. At rehearsal A, the established pattern begins to lose its original stability through fragmentation, and then is followed by another pattern that is not quite in sync with

the opening pattern leading into a climax and break. At rehearsal B, stability returns with the recapturing of the original pattern. So far, these two patterns would suggest a kind of large-scale binary formal structure: the first part (mm. 1–41) establishes a stable pattern and then builds instability into a terminal point that we would label as *open*, and the second part (mm. 42–end) recapitulates the opening stable pattern and retains it to the end.

The concept of departure and return, as well as the use of terms like *binary* and *open* naturally lead to the question of harmony and key. As has already been noted, the limiting of the root progressions to ascending minor and major seconds rules out functional differentiation of root progressions. However, the fact that the first 22 bars sit entirely within a single diatonic collection, in conjunction with the scalar bass and the repetition of C as the lowest or first note of the scale, suggest the possibility of a *home key*, or perhaps the twin possibilities of a home *collection* and a home *scale-degree 1*. That is, the bass line easily fragments into scalar units: mm. 1–4, 5–9, 10–14, etc.; each of these scales has both a collection and a first/lowest note, both of which are salient features. Do either of these features—or both in conjunction—articulate patterns of stability and instability?

First, let us consider the possibility of a *home tonic* or *home scale-degree 1*. There are 18 scalar ascents in this movement (counting the final C–D motion as a scale or fragment thereof), with the following succession of starting pitches:

Table 5.1. Starting pitches of the 18 scalar ascents in "Szajkó."

scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
tonic	C	C	C	C	C	C	A	B♭	B♭	C	B♭	B♭	C	B♭	C	C	C♯	C

In this succession, there is structure to suggest the possibility of a home tonic, with a standard departure-return framework. That the first six scales all saliently emphasize C as their "tonic" is noteworthy. In the first third of the movement, Ligeti raises the possibility that C

would be a global tonic through this emphasis. The middle third of the movement (scales 7–12) see a departure from this home tonic: only one of the six scales begins on C. The latter third sees somewhat of a return home, with four of the six scales beginning on C. On a general level, then, there is a home-departure-return frame to the organization of the scalar tonics in this movement that would lend support to the idea of a home tonic in the succession of bass scales of this movement.

It is also worth noting the location of the once-occurring tonics of A and C-sharp. A begins scale 7, the three-octave chromatic ascent that precedes the high point of tension in the parameters already discussed. C-sharp begins the penultimate scale (and the final *complete* scale, no. 18 being a scale fragment), thus occupying the space immediately preceding the final appearance of the potential home tonic. It could be that these novel scalar tonics fill a functional role of building anticipation for an immanent arrival of an important tonic: A signals the coming of B-flat, the tonic to dominate the middle part of the movement, ascending by semitone; C-sharp signals the coming of the final statement of the home tonic, descending by semitone. This would leave the first third of the movement as C space, the middle third as B-flat space, and the final third as C space (with one instance of the other tonic in each of the latter two sections)—a fairly straightforward ternary form, in terms of the scalar tonics. In that ternary form, we could interpret C as the stable tonic (analogous to a global tonic in tonal music), B-flat as the primary unstable tonic (analogous to the global dominant), and A and C-sharp as heralds of momentous arrivals in the "key" scheme of the movement.

Does the pitch-class content of each scale confirm and strengthen this functional arrangement? Or does it present a different functional schema articulating a different formal structure? Or does it lack functional or syntactic properties altogether? The following figure

provides the pitch-class content of each of the 18 bass scales (we will consider the extent to which the upper voices follow the same pitch-class content subsequently).

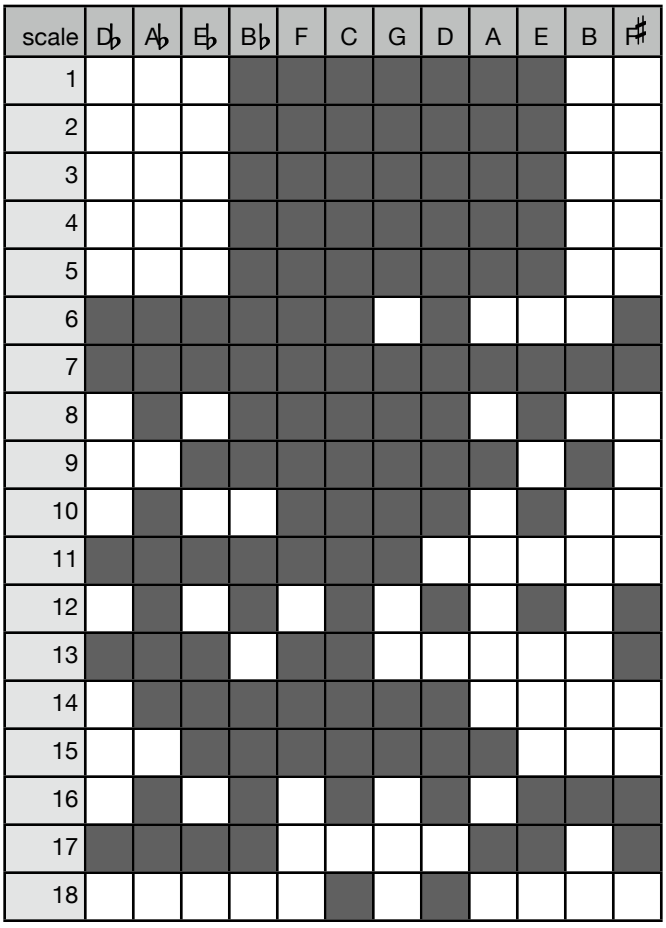


Figure 5.21. Pitch-class content of each of the 18 bass scales in "Szajkó." Pitch classes present are shaded in dark gray.

This graphic presents the pitch-class content on the circle of fifths for expediency, as the diatonic and acoustic scales of this movement are made up of pitch-class collections contiguous or nearly contiguous on the circle of fifths, and the chromatic and whole-tone collections used in this movement are visually identical on the circle of fifths and the circle of semitones. Thus, the circle of fifths allows us to track the pitch-class-content relationships between the various scales more easily.

Analyzing the pitch-class content of these scales affords a more detailed analysis than that of analyzing only the first degrees of each scale. In figure 5.21, we can see very clearly the stasis of scales 1–5, C mixolydian. Scale 6 (D-flat major, plus D-natural, m. 23) moves to a pitch-class collection whose pitch-class content is nearly minimally similar to that of scales 1–5 (two scales of cardinality 8 and 7 can share a minimum of three common pitch classes; these share 4). This is followed by scale 7 (m. 29), which contains the full chromatic aggregate—the superset of all supersets, rendering any relationship with other collections trivial. Scales 8–10 (mm. 42, 46, and 50) bring a near return to the original pitch-class content of scales 1–5: scales 8 and 10 differ by one pitch class, while scale 9 adds the two pitch classes closest to the original collection on the circle of fifths and omits one (E). Scales 11 (B-flat dorian, m. 52), 12 (C whole-tone, m. 55), and 13 (C locrian, m. 58) provide an extended passage with nearly minimal pitch-class content similarity to the opening collection. From scale 13 to scale 15 (m. 60—rehearsal C—and m. 63 for scales 14 and 15, respectively), however, it seems as if the pitch-class content is progressing towards a recapitulation of the opening collection: the C-locrian collection (D-flat major) moves two steps on the circle of fifths to B-flat mixolydian (E-flat major), and then one more step to C-dorian (B-flat major). One more step toward the sharp side, and we will arrive at the original C-mixolydian (F major) collection. However, instead, scale 16 (m. 66) brings a whole-tone (plus an extra pitch-class) collection, followed by scale 17 (m. 69), which is minimally similar in pitch-class content to the original collection (C-sharp minor with both raised and lowered sixth degrees). This collection contrasts the pitch-class collection of the original more than any other bass scale in the movement, and it prepares the arrival of the final scale fragment (the last two chords)—incomplete, but the exact bass pitches we would expect to begin a return to the original collection (neither of which are present in scale 17).

This analysis suggests that pitch-class content also plays a functional role in the form of this movement, with the stability of a pitch-class collection being equivalent to its similarity in pitch-class content to the original collection. Ligeti establishes an opening "home" pattern in mm. 1–22, which breaks down and progresses into the tonally opaque chromatic collection. Ligeti then returns, almost, to the original pitch material in scales 8–10, followed by a section of contrasting pitch-class content in scales 11–13. Ligeti prepares a return of the original collection through the progression of scales 13–15, which is elided by a nearly whole-tone collection. The following collection creates the most incongruity with the original collection—and the greatest tension for any listener anticipating the return of the original collection—which is released in the arrival of the final scale fragment. (Of course, the incompleteness of this scale ends the movement with another kind of tension.)

We can see this narrative play out spatially on a map of scalar collections created by Dmitri Tymoczko (2004). The following figure is Tymoczko's example 13 (p. 243), a map of the "Pressing scales" where adjacent, connected chords share the maximum number of pitch classes possible for the two collection types.[14]

[14] Pressing scales include the diatonic, acoustic, octatonic, whole-tone, harmonic major, harmonic minor, and hexatonic scales. They share a number of interesting properties, most notably the avoidance of (012) trichords and, correspondingly, strong support for triadic construction.

Figure 5.22. Dmitri Tymoczko's (2004) circle of fifth-related diatonic scales. Bass scales used in "Szajkó" are circled and labeled according to their order (the chromatic collection is not on the circle).

On this map, we can see that all but one of the scales Ligeti uses in Szajkó can group together spatially, and that Ligeti makes substantial use of the collections closest to the original C-mixolydian (F-major) collection. We can also see the near-home location of the pitch material in scales 8–10 (B-flat major, B-flat acoustic), the progression toward home in scales 13–15 (D-flat major, E-flat major, B-flat major), and the distance from home of the penultimate collection (E major). This spatialization confirms the intuition of considering pitch-class content similarity with the opening collection a criterion of stability in this parameter.

As mentioned above, the opening C-mixolydian bass scales are accompanied by upper voices which contain the same pitch-class content. However, the upper voices in this movement do not always match the pitch-class content of the bass. The following figure provides the total pitch-class content of each section delineated by the ascending bass scales.

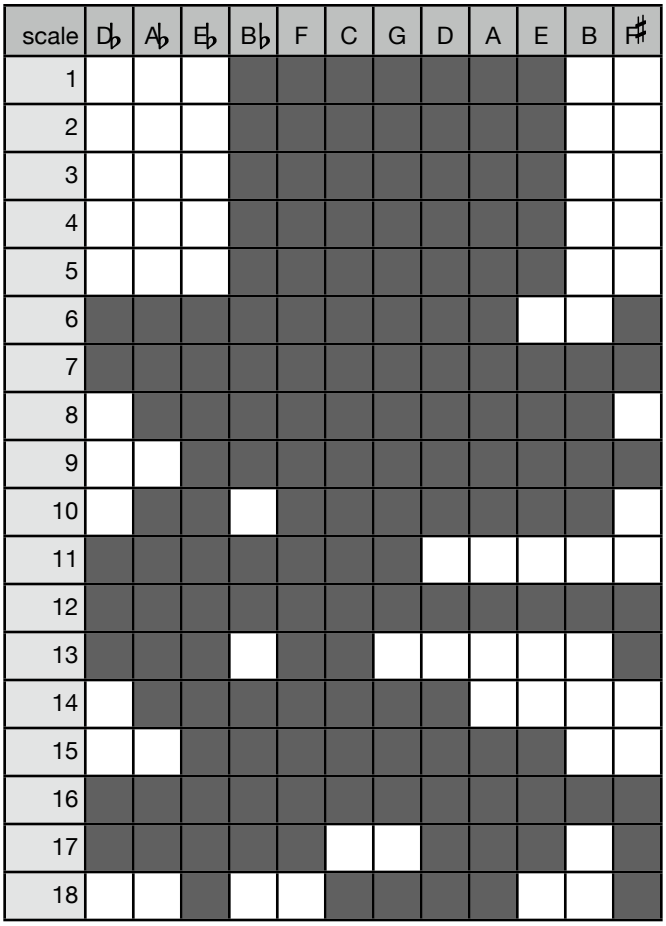


Figure 5.23. Pitch-class content of each of the sections delineated by the 18 bass scales in "Szajkó." Pitch classes present are shaded in dark gray.

There are several things to note about the total pitch-class content of each section delineated by these bass scales that add something significant to the above analysis of the pitch-class content of the bass scales. First, the total pitch-class content of the scale-6 passage is closer to filling the chromatic aggregate when all voices are considered; thus, the move away from the initial collection is more drastic. Second, the section delineated by scales 8–10

is not quite as dramatic of a return to the original collection when all voices are considered. Though the bass scales share all but one tone in common with the original collection, the upper voices cloud that relationship, making the return more tenuous. Third, both occurrences of the whole-tone scale in the bass are accompanied by its complement in the upper voices (due to the parallel fifths between bass and tenor). So while Tymoczko's map shows a close relationship between the C whole-tone scale and many of the other scales dominating the bass line, the pitch-class content of these sections as a whole is a complete chromatic aggregate. Fourth, the progression toward the original collection noted above in scales 13–15 *is* reinforced by the upper voices. In scales 13–14, the upper voices contain the same pitch classes as the bass, and in scale 15, the upper voices add one pitch-class: E. This makes the pitch-class content in the scale-15 section the union of the B-flat-major diatonic (the C-dorian of bass scale 15) and the F-major diatonic (the C-mixolydian opening collection toward which this progression seems to be directed). Finally, though the scale fragment that ends the movement (C–D) could harken back to the original collection, the upper voices exhibit only a moderate common-tone relationship with the original collection.

Considering these differences along with the succession of bass scales and scalar tonics, we can see a slightly different formal narrative than when considering the scales or tonics alone. The first five scales (mm. 1–22) establish the C-mixolydian/F-major diatonic collection as a home collection. This breaks down at scale 6 with a nearly complete aggregate, and then the full aggregate at scale 7. Scales 8–10 (beginning at rehearsal B) suggest a *possible* return to the opening collection by means of bass scales closely related to the original. However, the B-flat tonic of scales 8 and 9, and the additional tones in the upper voices undercut a return interpretation. The distant relationship of scale 11 with the original and the complementary whole-tone scales in the scale-12 section confirm the non-return at rehearsal B. Scales 13–15

suggest the preparation for another return of the original collection and bass scale by moving nearly step-by-step toward the original collection on the circle of fifths. This is thwarted, again, by the occurrence of the two complementary whole-tone collections in scale 16. Scale 17 brings the non-chromatic collection most distantly related to the original collection, preparing a potentially large release of tension at the arrival of the original collection on scale 18. However, though the bass fragment of scale 18 brings what we would expect from a return to the opening collection, the upper voices call that return into question.

Taking the stability/instability narratives for the independent features of pitch-class collection, scale, tonic, scalar pattern, and bass register all together, we can see how Ligeti uses the establishment of stable patterns in these parameters and the instability generated by breaking those patterns to construct a clear, audible formal structure to the movement. The following graphic shows this interaction and the resulting structural moments in the form.

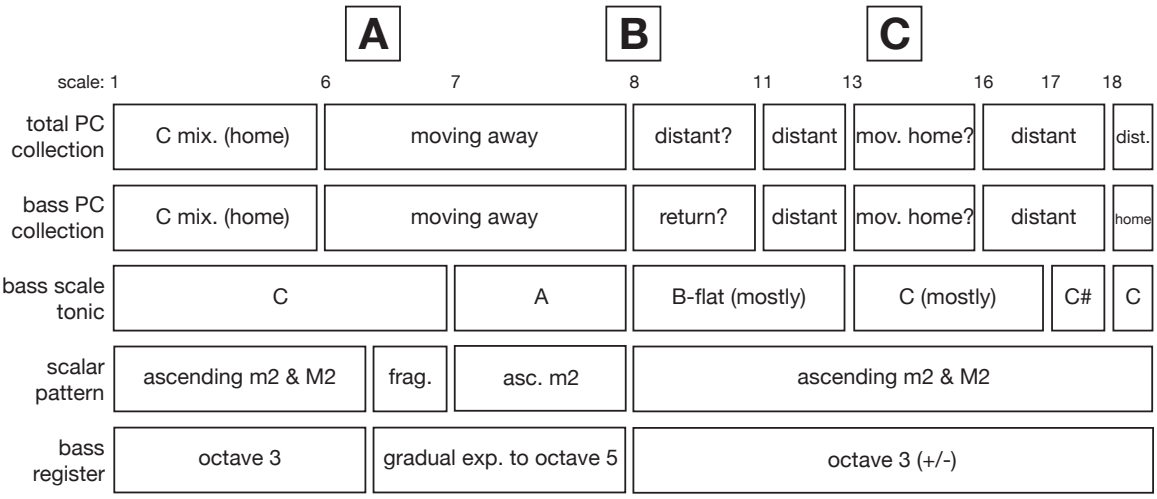


Figure 5.24. *Síppal, dobbal, nádihegedűvel*, VII., formal structure. Arabic numerals denote bass scale cycles.

This graphic makes the stability/instability patterns in the large-scale form of the movement very clear. Beginning with scale 6 (m. 23, two bars before rehearsal A), each of the five parameters—one or two at a time—move away from the patterns established in the first 22 bars

of the movement. There is a break in all five parameters at rehearsal B, with a return to the original patterns in two parameters and a near return in a third. At m. 52 (scale 11), by which point the scalar pattern and the bass register have returned to the original patterns for good, none of the three tonal parameters contain the original patterns. At m. 58 (scale 13), it looks like we may be returning to the original pattern in all five parameters, but by m. 69 (scale 17), all three have lost the original pattern again, preparing the final scale arrival, where four of the five parameters return to the original pattern.

These final two chords are as close to home as Ligeti brings us after m. 22, and yet one would be hard pressed to call this a satisfactory resolution of all tonal/melodic tension—a full cadence, as it were. But, in the context of Ligeti's common practice of ending a movement by tearing off mid-process, this "return," with the degree of closure and resolution it does bring, is remarkable. Further, whatever lack in resolution or return exists at the end of this movement, it is clear that the form of this movement involves a longing for return. The point at which the movement is the most distant from home is its climax—immediately preceding rehearsal B—and the return home is the principal motive on which the remainder of the movement is based, and this happens primarily in the tonal/harmonic domain. Thus, in this movement, there is not only the presence of both necessary components of harmonic syntax—a rule for combining chords into progressions and discrete categories of stability and instability—but harmonic stability and instability are primary contributors to the formal structure of the movement.

VI. CONCLUSIONS

In Chapter 1, I put forward two questions that this dissertation seeks to answer: 1) do Ligeti's late triadic works present what we might call harmonic syntactic structures?; and 2) to what extent are those syntactic structures based in tonal procedures? My analytical approach was built on a two-part understanding of harmonic syntax from the writings of Leonard Meyer and Aniruddh D. Patel: harmonic syntax involves rules or norms for the ordering of harmonies into successions and at least two categories of stability and instability to which we can assign chords or chord-progression types.

In Chapter 2, I performed a statistical analysis of the root content and the root-to-root-interval content of the six most heavily triadic works from the latter part of Ligeti's career—*Hungarian Rock* (1978), *Passacaglia ungherese* (1978), "Fanfares" (Étude for piano no. 4, 1985), and the last three movements of *Sippal, dobbal, nádihegedűvel* (2000)—comparing the results to analyses of two tonal corpora. This analysis presented evidence of meaningful, non-random structure to the ordering of Ligeti's harmonic successions in these movements, as well as significant relationships between the structures of these movements and the representative tonal works. Specifically, the tonal works privileged short-distance root motions on the circle of fifths between successive chords, and they exhibited directional asymmetry for the closest root intervals. Ligeti's works, for the most part, shared the privileging of close circle-of-fifths root motions, though some movements exhibited the opposite—also a sign of potential influence. By and large, Ligeti's triadic movements also exhibited directional asymmetry, though often privileging different directions or exhibiting this property on different root intervals than in the tonal corpora. These results led me to conclude that the standard tonal-vocabulary-but-not-tonal-syntax interpretation of these works is problematic—as is Searby's interpretation that these works are fundamentally atonal (2010, p. 24) and

that the tertian chords are "essentially coloristic" in their function (ibid., p. 18)—and that there is sufficient evidence to warrant further investigation of the relationship between Ligeti's harmonic structures and those of common-practice tonal music. In terms of the research questions of this dissertation, this analysis suggests that there are guiding principles for the ordering of chords into successions, and that there is reason to believe that these principles may have their foundation—at least in part—in tonal harmonic practice. Further analysis would be required to find categories of stability and instability, or to establish a link of more than correlation between Ligeti's structures and those of tonal practice. The results of this study also raised specific questions about the harmonic structures of each movement, to be explored in subsequent analysis.

Chapters 3–5 then explored these questions and other features of the harmonic structures of these six movements through direct analysis of the scores of these movements and, where appropriate and available, the precompositional sketches preserved for these movements. The analyses of Chapters 3–5 confirmed the conclusion of Chapter 2 that there are meaningful syntactic structures in these movements. Both principles for the ordering of chords into successions and categories of stability and instability can be found in these movements, though these principles and categories may not be the same for each movement.

In the case of *Hungarian Rock*, the descending-fifth root motion functions as a clear gesture of stability and closure. For the bulk of the movement—in which there are no significant points of harmonic or formal arrival—the descending-fifth root progression is withheld, and when it does occur, its power to project a sense of closure is mitigated by other musical factors. In the concluding bars of the movement, however, those mitigating factors are removed, and the descending-fifth progression is used prolifically and prominently, with the clear purpose of articulating closure and punctuating the large-scale form of the movement.

In *Passacaglia ungherese*, Ligeti uses acoustical consonance and dissonance to fill the same formal-functional role as what has been called structural consonance and dissonance in common-practice tonal music. He also generates expectation early in the movement for pitch classes C and E to fill structural roles in the movement, which they do, and in ways perceptible even by attentive listeners who do not possess absolute pitch.

In the case of "Fanfares," in m. 116ff.—the first full iteration of the "fanfare" theme, and the passage for which we have access to the most precompositional sketch material—Ligeti is highly sensitive to the tonal pull that certain chords and progressions have. Specifically, he uses chords with the strongest tonal pull—those bearing tritones, such as tritone dyads, diminished triads, and dominant- or diminished-seventh chords—primarily in places where they can resolve according to tonal expectations. He also places these strong tonal-syntactic chord progressions strategically throughout the passage; that is, he withholds them early on and introduces them in greater numbers as the passage continues. This suggests that, though standard tonal functions (tonic, subdominant, and dominant) are absent from this passage, Ligeti uses *tonal functionality* as a function; strong tonal-syntactic chord progressions are not used as initiatory gestures early in the passage, but increase through passages of continuation into those of termination, increasing expectation of a tonal arrival as we get nearer to that moment.

In "Alma álma," we found that certain harmonies—B-flat and C, usually with C prolonging B-flat—generated a sense of harmonic stability, as did close progressions on the circle of semitones (ic1 and ic2 root motions). Both kinds of stability—as well as the instability of dissonant chords, chords with roots other than B-flat and C, and large root intervals (measured on the circle of semitones)—are essential to the articulation of the form of the movement.

"Keserédes" has similar properties. However, the stable harmonies are chords close to C on the circle of fifths, and the stable harmonies are short-distance progressions (measured on the circle of fifths).

Finally, "Szajkó" contains several parameters of harmonic stability and instability: the pitch-class collection of the scalar fragments in the bass (which doubles as the succession of chord roots), the pitch-class content of the upper-voice harmonies, the scalar "tonic" of the bass, the intervallic structure of the bass, and the register of the bass. No one parameter suffices to generate an overall sense of stability or instability, but their interaction is the primary contributor to the articulation of large-scale form. Interestingly, that formal structure is very similar to that of "Alma álma," though articulated in different ways.

In all of these movements, at least some of the norms for ordering chords into successions and some of the criteria for stability and instability are reminiscent of tonal music—for instance, the privileging of short-distance root motions on the circle of fifths (and the mapping of that pattern onto the circle of semitones in "Alma álma"), the use of descending-fifth root motions to articulate points of closure in *Hungarian Rock*, or the use of certain chordal roots as "home" in *Passacaglia ungherese* and the final three movements of *Sippal, dobbal*. The use of *tonal functionality* as a stability-generating function in itself in *Hungarian Rock* and "Fanfares" is another interesting and significant relationship of Ligeti's harmonic structures to those of common-practice tonal music. Further, we have seen in Ligeti's sketches—where available—that the harmonic structures of these movements are not "incidental byproducts" (Steinitz 1996) of other processes at work, but that Ligeti made conscious choices, sometimes making deliberate changes to earlier versions produced by processes carried out in other domains, that reflect an awareness of, and sensitivity to, the harmonic-syntactic structures he was creating and their relationship to tonal structures.

Based on the analysis presented in this dissertation, I believe that we can say with confidence that in these six movements, Ligeti composed meaningful harmonic successions, that those successions can be said to be syntactic, that the structures of those successions and the properties of those syntaxes have a strong relationship with some fundamental aspects of the successions and syntax of common-practice tonal music, that Ligeti was aware of that relationship, that Ligeti intended that relationship, and that understanding that relationship is fundamental to understanding the harmonic and formal structures of these works. In terms of the research questions of this dissertation, this analysis found evidence of meaningful syntactic structures—both in terms of principles for the ordering of harmonies and categories of stability and instability—and evidence of conscious employment of common-practice harmonic syntactic structures on Ligeti's part.

These conclusions raise two primary questions regarding Ligeti's use of triads and other "tonal" chords in some of his late works. First, why do the analytical data and conclusions presented in this dissertation contradict the common claims made by other scholars who have studied these pieces? The answer, already discussed in the opening chapter, is simply that though the common claim that Ligeti uses the "vocabulary" but not the "syntax" of tonal music is a straightforward and falsifiable claim, that falsifiability never leads to the analytical spadework necessary to verify the claim. Rather, those claims are largely grounded in statements made by Ligeti about his own music—that it is "neither tonal nor atonal" (Dufallo, pp. 334–35), "neither 'modern' nor 'postmodern'" (ibid.), "diatonic . . . and not yet tonal" (Ligeti's program notes Sony's *Ligeti Edition 3: Works for Piano*, piano Études). That makes the second question all the more pressing: why do the analytical data and conclusions presented in this dissertation contradict the claims made by *Ligeti* about his use of tertian harmonies in these late works? To understand the statements Ligeti made late in his career about his use of

tertian harmonies at the time, it is helpful to look more broadly at Ligeti's writings on contemporary music throughout his post-emigration career to establish a context for those later statements. In the light of that context, some helpful insights will come to light.

Ligeti's writings in the first years after his emigration to the West, many of which can be found in *Die Reihe* or the *Darmstädter Beiträge zur neuen Musik*, deal to a significant extent with the problems facing serialist composers at the time.[15] These problems include the nature of composition after the discovery of the "'nature' of the elements" of music (i.e., the parameters of pitch, duration, and loudness in relation to single tones) was made, by necessity, in the electronic studio (c.f., Eimert 1957/59, p. 9; Ligeti 1958/60, p. 62); the inherent contradiction of the dictum to avoid repeating the past—which leads to an aversion both to directionally oriented functional tonality *and* periodic (and thus to a large measure, static) figures such as ostinati (c.f., Ligeti 1960/65, p. 18; Ligeti 1966; Adorno 1966/2008, pp. 204–05); the problem of octaves forming at the intersection of serial lines (Ligeti 1958/60; Ligeti 1960/65, pp. 7–8); and the general question of musical form post-Schoenberg, post-Webern, and post-early "integral" serialism (again, c.f., Ligeti 1966; Adorno 1966/2008). In fact, Ligeti even claims in "Metamorphoses of Musical Form" (1960/66) that *Apparitions* and *Artikulation* are attempts to work out solutions to some of these serialist problems (pp. 14–15).

Indeed, analyses of *Apparitions*, *Artikulation*, and other works do bear out the idea that some of Ligeti's works and compositional devices post-1956 are part of an attempt to "solve" these problems that arise in the history of serialist and post-twelve-tone music. For instance, in "Metamorphoses," Ligeti describes one of the problems of serializing durations,

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[15] While this should not be surprising given the company Ligeti was keeping in the late 1950s and the 1960s, it can be surprising today given the staunch anti-serialist stance attributed to Ligeti in much of the historical and critical literature. Again, this is largely due to the claims made by Ligeti to be "neither 'avant-garde' nor 'traditional'" (Ligeti, liner notes to *György Ligeti Edition 3*, pp. 11–12).

such that twelve different note durations each occur an equal number of times in a work: "The problem is, that the longer a duration-interval is, the more dominating its effect, for in the series and all structures proceeding out of it only one shortest duration is available to counter-balance the longest. . . . The fact that the longer durations dominate destroys the 'non-hierarchicalism' that serial organization is trying to establish" (p. 13). Ligeti follows this articulation of the problem by explaining several approaches taken by composers to correct the accidental hierarchy of duration, all of which, he writes, "inescapably result in the destruction of the original fixed pre-determination of the durations," focusing on "higher-order control systems" (p. 14). Ligeti suggests, instead, that "Irregular distribution of the elements on a statistical basis could then take the place of fixed series" (ibid.). An exemplar of this is his *Apparitions*, in which "the product of each duration-value and the number of times that it occurred in the whole structure was constant. . . . [T]he shorter a particular duration-interval, the more frequently it appeared in the context, and so many short durations were used for every long one that the sum of the short ones equalled that of the long" (ibid.).

Ligeti then goes out of his way to make sure his readers interpret his technique as one that is employed in service of *saving* serialism, rather than *subverting* it. "It must be admitted, however, despite the fact that by this means we have succeeded in excluding another rudimentary trace of a hierarchical system, that the essential nature of the serial principle itself has here been called in question. But, as mentioned earlier, the serial principle itself has already been called into question" (ibid.).

The next two paragraphs of "Metamorphoses" similarly place *Artikulation* firmly within serialist tradition, if not in a salvific role. Just as Stockhausen's *Gruppen* distinguishes between multiple "aggregate-conditions"—textures of contrasting timbre and various de-

grees of density—and those different conditions mix with one another and transform into each other in a way that articulates the form of the piece, so does *Artikulation*. "In my electronic piece *Artikulation* the aspect that occupied me most was the composition of the mutual effects exercised by these 'aggregate-conditions' on one another. . . . The serial ordering of such behaviour-characteristics served as a basis for the erection of the form" (p. 15).

A final example can be seen in Ligeti's description of a compositional technique employed by Henri Pousseur. "[I]n Pousseur's Quintet for clarinet, bass clarinet, piano, violin, and cello, the basic 12-note series—borrowed from Webern's Saxophone quartet Op 22 in homage—is shorn of its function simply by filling out each interval chromatically. The pitch-series has been transformed into a series of densities" (1960/66, p. 7). Ligeti describes this as a stage on the way towards a complete abandonment of the "pre-formation of pitches" "in favor of serial depositions of a higher order" (ibid.). Compare this with Bernard's conclusion from his (1994) article, "Voice Leading as a Spatial Function in the Music of Ligeti":

> [Ligeti's] reaction to European serialism of the 1950s led him to eliminate, as far as was possible, pitch (especially pitch-*class*) and interval functions, substituting for them, respectively, a simple distinction between high and low and a scale of larger or smaller "bandwidths" (that is, intervals as vertical spans of absolute size) filled more or less densely (p. 249).

Bernard's analysis leads him (rightly, I think) to conclude that "bandwidths"—or intervals between upper and lower boundary pitches—and density are important functional aspects of Ligeti's music of the 1960s. However, while Bernard takes this as a "reaction" to serialism, it is clear from Ligeti's description of some distinctly serial problems in 1960 and recent attempted solutions to those problems that the functional properties of bandwidth and density in Ligeti's music of the 1960s are further attempts on Ligeti's part to address these same problems, and there is a close connection between his bandwidth technique and Pousseur's use of the series in his Quintet. We cannot speak of "a reaction to the modernist impulse

found in [Ligeti's] works of the 1950s and 1960s" (Drott 2003, p. 286) without significant qualification. In a very real sense, *Apparitions*, *Artikulation*, *Lontano*, and other works of the late 1950s and 1960s are *serialist* works, and Ligeti is a *serialist* composer.

Returning to the matter at hand, within this serialist context, Ligeti addresses the issues of harmonic syntax, harmonic function, and formal function prominently in several writings. The first is his 1958 article "Pierre Boulez: Decision and automatism in *Structure Ia*" (*Die Reihe* 4). This article is commonly held up as a critique of serialism in general, and Boulez in particular, by an outsider—an interpretation problematic by the mere fact that this article occurs in an early issue of *Die Reihe*—but I find that this article makes more sense as a response to Eimert's 1957 article "The Composer's Freedom of Choice" (*Die Reihe 3*). In the latter article, Eimert works against a common view of serialism as "total predetermination" (p. 4), and—as one of his goals in the essay—Eimert seeks to demonstrate the great deal of freedom a serialist composer has in composing according to serialist principles in the multiple dimensions of the "nature" of the tone. By multiplying the number of choices and the number of musical venues in which to make those choices, the new developments in serialist music greatly increase the freedom of the composer. That is, *choice* equals *freedom*, and manifold options from which to choose leads to the *opposite* of "total predetermination."

Ligeti, right from the start of his article in *Die Reihe 4*, challenges this view: "decision is not to be confused with freedom, nor automatism with compulsion. . . . [C]hoice and freedom are united in the process of choosing one's mechanism" (pp. 36–37). Ligeti goes on to demonstrate, using *Structure Ia* as a case study for this argument (though he does not use it solely for that purpose), that decision (i.e., choice) and automatism (i.e., total predetermination) are in a feedback loop; not only are composers free to make decisions in non-serialized parameters of the music *after* the automated serialist processes have generated the pitch,

rhythm, and dynamic material for a work, but "clearly the automatism of the serial loom[16] can be artistically exploited, if elements and operations are well chosen" (p. 46). In other words, in the sequence of decision 1–automatism–decision 2 (Ligeti, p. 36), a skilled composer can anticipate in the early stages of decision (Eimert's "predetermination") what the outcome of those decisions will be at the end of the automatic process, at which the composer is also at liberty to manipulate the results according to other parameters that the composer decided to leave untouched during the automatic process. This is the paradox of "self-limitation from choice—as if the composer were taking himself for a walk on the end of a lead" (p. 62); or, in the spirit of Ligeti's many *neither/nor* statements later in his career, "Not wholly free, then, but also not totally compelled" (p. 36).

While much more could be said about the issues of freedom, automatism, and the relationship between these two articles, what is most important for the question at hand is the way that Ligeti (partially indebted to Eimert) treats the concepts of function and progression through time in this article. In the middle portion of the article (devoted primarily to the analysis of *Structure Ia*), Ligeti makes several observations in Boulez's composition that he relates to functional tonality. First, on p. 51, Ligeti notes that Boulez's use of fermatas to punctuate the ends of formal divisions is "wholly functional." This is not only because Boulez uses fermatas to punctuate these formal sections, but because he uses the longest fermatas in places where other parameters of the music lend themselves more strongly to continuation. Shorter fermatas are used at the ends of passages where the break is more clearly defined by other elements of the music. In other words, not only are there fermatas in a *location* in the form that corresponds to their function in common-practice music, but we can also see an *intention* in their being placed where they are placed for a specific reason.

[16] A clear reference to Eimert's reference (1957/59, p. 4) to Goethe's *Faust*, Part I, Scene I, "Am Webstuhl der Zeit."

That is, the way Boulez incorporates the fermatas betrays his desire to generate a sense of relative repose at the end of each of these formal divisions—they do not provide an accidental perception; they serve an intentional function.

The issue of intention in relation to function once again arises on p. 53, where Ligeti discusses the intersection of multiple serial lines with co-articulated simultaneities. Ligeti interprets these "chords" as function-less "interference-maxima" because they are accidental results of the combination of serial lines. Though Boulez could have manipulated his lines and their combination in order to effect the creation of certain chords and chordal relationships, there is not evidence of such manipulation. Lacking that manipulation—or, again, *intention*—Ligeti finds no *function*.

Lastly, Ligeti discusses on p. 58 a passage where a number of E-flats occur in unexpectedly close proximity to each other. Of this, he writes:

> But one may not regard this note as a "tonic" or central note—nothing of the kind can exist in this kind of music (since to compose "serially" means the abolition of any hierarchy of the musical elements); the pile-up of this note, being a purely accidental result, has no harmonic function.

We might speculate on the degree to which Ligeti intended this to be read ironically, noting the absoluteness of the stricture against hierarchy and the high degree to which Ligeti projects faithfulness to the party, but that would probably an anachronistic reading of this statement, drawing too much on his later disavowal of serialist ideology. Rather, this statement is again consistent with the two previous examples: the lack of *intention* on Boulez's part leads to a lack of *function*.

This requirement for function to be based in intention is highly problematic, and that is not lost on Ligeti. In fact, the ease with which the automated processes of serialism can generate unintended elements—and thus lead a listener to perceive accidental structures

and functions as intentional, though they are and not part of the intended form—is one of Ligeti's primary points in this article. It is also a significant problem within serialism, and one to which Ligeti returns in "Metamorphoses of Musical Form" (*Die Reihe 7*, 1960/66). In this article, Ligeti replaces the decision/automatism feedback loop with that of technique and imagination (p. 5). This is largely the same binarism (technique mapping more-or-less onto the automated processes of serial composition, and imagination mapping more-or-less onto the composer's choice or decision), but replacing the terms allows Ligeti to direct his attention to the compositional and creative problem that this choice-automatism process generates. Specifically, in focusing serial procedures on the defining parameters of individual tones, function is lost (p. 6), and a "flattening-out process" begins (10), whereby serial structures are so densely superimposed that individual serial lines are obfuscated (p. 6), and the composer loses direct control over the determination of intervals (p. 6) and large-scale form (p. 5). In this article, Ligeti is seeking a form of serial composition that will allow serialist composers to regain control of large-scale form, as well as compose works beyond the length of twenty minutes (p. 12).

Again, there are many more things we can say about the relationship of this article to the broader project of serialism at the turn of the seventh decade of the twentieth century, but what is significant for this dissertation is what Ligeti writes about stasis and the flow of time. Because of the homogeneity of the serialized materials and the lack of direct control over certain surface features and large scale structures (this discussion clearly builds upon Ligeti's analysis of *Structure Ia*), serial music has tended toward the static (p. 16). However, Ligeti writes, "there is a tendency once more to allow time to flow in one direction only" (p. 18). Of course this is not a new direction. Just as the "discovery" of the "nature" of individual sounds previously led to the serialization of all the parameters of those sounds, the rediscov-

ery of the "irreversibility of [individual] sounds" (p. 18) leads serialists to negate the stasis that those serial processes created in order to "serialize" (that is, to exercise direct compositional control over, for the purposes of mimicking the fundamental nature of sound and sounds) large-scale form. This renewed emphasis on directional, forward-moving forms leads to several results in Ligeti's eyes. First, it leads to "the radical exclusion of *ostinati*, and makes the appearance of any openly periodic shape or formal feature quite insupportable" (p. 18). Second, when taken to the extreme, it leads to "a situation in which one is forced to design every particular differently from all the others, to write every little bit of music as if one had to think everything out right from the start, . . . 'like a write who has to provide himself with a special vocabulary and syntax for every sentence he writes' [quotation of Adorno]" (ibid.). Third, it leads, even more extremely, to the avoidance of repeating not only structures within works, but entire works themselves. That is, it leads to modular pieces, where the highly structured and ordered elements cannot be performed in the same order more than once; each performance must be new—a non-repetition of all past performances (pp. 18–19).

In spite of the extreme nature of some of these results, there is a potential difficulty with the serialist recapturing of the directional flow of time, as Ligeti sees it: the relationship of the new serial structures to those of traditional tonality.

> Whether the directionally orientated forms that emerge as a result are to be regarded as regressive because of their affinity with the discarded tonal ones, or not, must remain an open question (p. 18).

In the immediate context of this passage, it seems as if Ligeti is simply referring to the general property of the new serial forms as directional and temporal, rather than static and spatial, that is potentially regressive. However, in the context of the opening pages of this article, as well as his 1958 analysis of *Structure Ia*, we can read the possibility for the recurrence of

chordal and formal function as potentially regressive. Once the composer can exercise intentionality over the occurrence and ordering of chords, as well as the large-scale formal structures of their compositions, the loss of function and the "flattening-out process" described above can be reversed.

Ligeti picks up this and a number of other threads from his 1958 and 1960 *Die Reihe* articles in his 1966 article for the *Darmstädter Beiträge zur neuen Musik*, "On Form in New Music" (unpublished draft translation into English by Ian Quinn; briefly discussed in Chapter 1 of this dissertation). Specifically, this article touches on the frequent disparity between composer intention and listener perception of form, the conflict between motion and stasis, the role of function and its relation to ordering, and—in direct dialogue with Adorno's article of the same title in the same volume (trans. by Rodney Livingstone, in *Music Analysis* 2008)—the historical meaning of basic musical elements. Though the article begins innocuously enough by stating simply that "'musical form' can be examined and described from several points of view" (p. 1), it is clear that his goal is to describe a way of achieving what he described in "Metamorphoses" as a solution to the problems laid out there and in the *Structure Ia* analysis: the composer's ability to control both surface features and large-scale structures, connecting form with intention. In the terms of "Metamorphoses," the imagination is directed toward form, and the technique (automatic processes) is subservient to the creation of the imagined form. Ligeti ends "On Form in New Music":

> Through a dislocation of the starting point of the compositional method, the possibility arises once again that form is an intentional object. This means that relationships internal to a compositional process largely coincide with the relationships evident in the composed music; at the same time, this means abdicating any dispositions and manipulations made in accordance with directives set up in advance: the compositional process is not the main given, only the conception of the totality of the form, the imagination of the sounding music. Whichever method is adopted snuggles up to the projected musical outcome and is designed in accordance with the formal demands of

> this outcome. Such a compositional process is at the same time bound and free: the vision for the resulting form is free, but the particular method is bound to the requirements of the formal conception thus stipulated (pp. 16–17).

Ligeti further writes that "a process not unlike the serial method can work" within this compositional framework, but this framework takes on the opposite orientation of traditional serialism: the form is the given, with the process largely constrained by the form; in *Structures Ia*, the process is the given, with the form largely constrained by the process. However, the serialization of the large-scale form described in "Metamorphoses" is entirely plausible within the framework suggested in "On Form in New Music." The result of this framework, whether or not the process is serialist, is the opposite of the effect of Boulez's procedures in *Structure Ia*—"the unintended will no longer creep in: the conception can eliminate in advance any undesired models" (p. 17).

Once again, there are a number of things one can say about this essay and its relationship to the aesthetic and technical questions facing the serialists of the mid-1960s; but it is Ligeti's discussion of syntax and function that is of primary importance for the present project, and Ligeti spends a great deal of time dealing with syntax and function. On the very first page, Ligeti writes, "musical form is more than just the relationship of the parts to one another and to the whole. Syntactic aspects take on a primary role in the understanding of form" (p. 1). As he discusses this role of syntax in the understanding of form, he builds on his idea from "Metamorphoses" that "function is more significant than that of mere arrangement" (1966, p. 2), that "the position of a formal unit within the whole does not place any obligations on the function of that unit, and (to turn it around) no function is bound to any position" (1966, p. 9). However, in "On Form and New Music," function is tied to more than intention; it is tied to history. Each musical moment exists both in the context of the work and in the context of "all music that has been previously experienced" (p. 3), "the all-

encompassing referential system of history" (p. 6). Likewise, the meaning of individual musical moments can only be understood in both of these contexts: "formal function . . . can be fully understood not merely within individual pieces, but principally within the chain of history" (ibid.).

As discussed in Chapter 1, this conceptualization of syntax and formal function is squarely in line with that of Schoenberg, when he writes that "to introduce even a single tonal triad would lead to consequences, and would demand space which is not available within my form. A tonal triad makes claims on what follows, and, retrospectively, on all that has gone before" (1926, p. 263). Though syntax for Ligeti need not be harmonic, it surely includes harmony. The use of a harmonic sonority with as much historical baggage as a triad makes syntactic claims on what comes before and after it; its function is dependent not only on its relationship to other structures within the work, but on every triad-containing work that has preceded it (and that follows it). Such a perspective is neither new nor surprising.

However, what is noteworthy in "On Form and New Music"—as well as his preceding articles in *Die Reihe*—is Ligeti's prognostication about the return of syntax and formal function to new music. He simultaneously sees this as the next logical step (if not a necessity) in the development of avant-garde music, and fully realizes the relationship between the syntactic, functional formal structures of even serialist music and those of tonal music of the past. In 1960, whether or not such relationships would be considered "regressive" by the avant-garde is "an open question." In 1966, Ligeti outright advocates for such development in composition. And, as the analysis of this dissertation has demonstrated, by 1978 he is not only composing music with clear directional structures and formal functions, he is doing so within the domain of triadic harmony. But by this time, Ligeti is describing his music very differently.

I have already catalogued a number of Ligeti's statements in the 1980s and 1990s of the neither-tonal-nor-atonal variety that directly contradict his musical practice, and that break with this earlier line of thinking regarding syntax in new music. But this is not the only thread from Ligeti's writings of the late 1950s and 1960s that is picked up in his compositions of the late 1970s and beyond but is denied by his writings and interviews of the same time. For instance, in the late 1980s, when his music is the most formally dynamic it has been since his emigration, he writes numerous times—particularly in reference to his Piano Concerto—that his music is "frozen time" (1988, "Zum meinem Klavierkonzert," in Ligeti 2007, pp. 296–300) and "objects which simply exist and which will not develop over time in the slightest" (1989, p. 281). Why is it that these ideas on form, function, and syntax that played such a significant role in his thinking and writing about music in the 1950s and 1960s appear so strikingly in Ligeti's music of the 1980s and 1990s, but are "shunned" in his writings and interviews of the same time?[17]

One major clue comes from the other changes in Ligeti's rhetoric beginning in the early 1980s, namely his discussion about his new, late style. In numerous interviews and program notes from the 1980s, Ligeti puts forward the idea of a three-period division of his career, with the division between early and middle coming at his emigration from Hungary to the West in 1956, and with the division between middle and late coming sometime after the composition of *Le grand macabre*, which was finished in 1977, with the exact point of transition coming at a number of different points in his career. At different times, Ligeti states that his new, late style is heralded by *Le grand macabre* (interview with Várnai, 1978, in Ligeti 1983), the Horn Trio (interview with Szigeti, 1983), and the Études for piano and the Piano Concerto (Ligeti, program notes for Teldec's *The Ligeti Project 1*), and we can see from those

[17] "I do shun major triads" (*Ligeti in Conversation*, p. 29—interview with Péter Várnai from 1978, the year in which *Hungarian Rock* and *Passacaglia ungherese* are composed).

statements that Ligeti is clearly seeking to direct the attention of critics and audiences away from some pieces and towards others—usually the most recently composed, or the next to be premiered.

In addition to being a marketing device for the promotion of different pieces, it is also clear that in the 1980s Ligeti is consciously attempting to build his legacy. He becomes much more prolific in giving interviews (including one interview with himself) and writing his own program notes, and he makes numerous verbal—and musical (c.f., the 1982 Horn Trio)—references to Beethoven, the quintessential three-period composer. During the late 1980s, a curious series of events takes place surrounding the sale of Ligeti's sketch materials to the Paul Sacher Stiftung in Basel, Switzerland, for study by music scholars. According to Richard Steinitz,[18] Ligeti left the pre-1956 manuscripts that he did not bring with him during his escape in his mother's cellar in Hungary. Ove Nordwall, over a period of time, smuggled them out of the country illegally (but with Ligeti's permission), used them to write his biography of Ligeti, and then sold them to the Stiftung in the late 1980s. Steinitz writes that Ligeti only approved of the sale of those manuscripts to Sacher along with the rest of his materials, which he was preserving elsewhere. Nordwall's premature sale of Ligeti's early material separate from the rest of it angered Ligeti (Steinitz 2003, p. 74), and led to strained relations from then on with the Stiftung. But why? Is it really such a big deal that Ligeti's early materials should make it to the Stiftung in the 1980s, and the rest of the materials come in 2000 (ibid., p. 279) and later? Perhaps Ligeti wanted a chance to censor or filter the materials first. Perhaps some irrational compulsion made Ligeti believe that they simply had to be delivered together. Or perhaps Ligeti wanted to keep them away from prying eyes until a later date and

[18] Steinitz provides the details of this story with no citations, and thus, it is probably based on an unpublished interview between author and composer, leaving the rest of us, unfortunately, unable to attempt to read between the lines of Ligeti's words or critique Steinitz's interpretation of them.

used the complete collection as an excuse to do so. Whatever the case, it seems that in light of the legacy-building rhetoric Ligeti is putting forward at this time, in light of the incongruence between what Ligeti has said about certain of his works and what a detailed analysis of the scores and/or sketches have revealed about those works (as exhibited in this dissertation), in light of Ligeti's apparent desire and incredible ability to project his desired interpretation of his works to critics and analysts ahead of time, and in light of Steinitz's writing that Ligeti's relations with the Sacher Stiftung were strained after the manuscript sale (rather than Nordwall who did the selling), I am inclined to believe that Ligeti's exasperation over this premature sale was due to his desire to exercise control over his legacy—the way those earlier works and the history surrounding that volatile and mysterious time in his life would be understood. And this desire to manage his legacy, to write his own history before it was finished, seems to be a major motivating factor in a number of his decisions from around 1980 to the end of his life.

The question remains, though: why would such a motivation lead Ligeti to say one thing and do another when it comes to his incorporation of harmonic materials from common-practice tonal music? More specifically, why would so many threads in his writing of the 1950s and 1960s end up in his music of the late 1970s and beyond, but be contradicted in his writings and interviews of that same time period?

I think that the most likely answer to this question lies in the content of Ligeti's late style that he wished to project. He wanted to control his legacy and the interpretation of his recent, contemporary, and upcoming works, and he wanted to situate that interpretation in a clear relationship to the paradigmatic musical example of late style, Beethoven. As numerous critics and analysts have noted, Ligeti makes obvious references to late Beethoven in the music of the Horn Trio and in his writings and speakings about it. If *Le grand macabre* can repre-

sent "Doomsday" for him, if he can play up the illness-necessitated creative break from 1978–1982 as making him aware of his own "lateness," as it were, and if, along with the 1956 geographical and stylistic emigration, Ligeti can use these circumstances to generate his own three-period division of his compositional career, then Ligeti can make strong claims of kinship with Beethoven. Maynard Solomon (2003, *Late Beethoven: Music, Thought, Imagination*—notice the similarity with Steinitz's title, *György Ligeti: Music of the Imagination*) lists a number of motivating factors and characteristics of Beethoven's late style, among which are several which could easily apply to Ligeti: vulnerability to aging, the psychological stress that comes with lack of domestic happiness (Steinitz 2003, pp. 253–55, points to this in the discussion of circumstances surrounding the Horn Trio's composition), exhaustion of the "heroic style" (Ligeti speaks of exhausting the material of his middle period, and the last work of that period, *Le grand macabre*, contains references to the *Eroica* symphony, which Ligeti himself brings up in discussion of the opera), self-parody, and an awareness of his own mortality—a race against time, so to speak (pp. 1–3). Another source on "late style," of which Ligeti was surely aware, is Adorno's article—mentioned above—"Form in the New Music" (1966/2008), from *Darmstädter Beiträge 10*. In that article, Adorno writes of the tendency of the musical forms of that time to tend toward disintegration, saying that "This phenomenon is by no means the product of the latest developments in music . . . Indeed, it can be thought of as an idiosyncratic feature in the late style of many important composers. Beethoven's last works, for example, are intentionally fractured" (p. 207; Gustav Mahler's late works are also mentioned as paradigmatic examples of this formal tendency). This property can be seen in a number of late works, but most starkly in Ligeti's final two compositions (the Hamburg Concerto and *Sippal, dobbal, nádihegedűvel*), which can be seen as "intentionally fractured," each containing seven movements, which in the case of the Hamburg Concerto are further di-

vided into sub-movements. And, of course, the most obvious connection to Beethoven are the direct musical references to his music—*Le grand macabre* to the "Eroica" symphony, and the Horn Trio to the "Les Adieux" sonata. That the two works with the strongest intentional references to Beethoven come at the end of the middle period and the beginning of the late period in one telling of the three-period narrative is hardly coincidental.

The conflict between Ligeti's developing concept of musical form that began in the late 1950s and his legacy-building project that began in the early 1980s is clear. The former would emphasize longer works with coherent syntactic structures, as well as an active awareness of the historical significance of musical elements. The latter would emphasize shorter or fragmented works that break from the now-exhausted material of the past. Both approaches have served him well in helping him to stand out as an individual within the marketplace, so to speak. But it is clear that in the latter part of his career, in spite of the fact that he continues to write music in line with his earlier rhetoric on form and syntax, Ligeti desires to be seen as a "late" composer—both in terms of his own career, and in terms of the broader history of music. Thus, while composing music that draws heavily on both tonal and atonal musics of the past, he states that his music is "neither tonal nor atonal." And these two strains in Ligeti's musical and verbal output—the continual engagement with the serialist problem of form, which manifests itself ironically in Ligeti's rehabilitation of consonant harmony and harmonic syntax, and the "late," individualistic, fragmented, Beethovenian persona—are fundamental to a complete and nuanced understanding of Ligeti's music and Ligeti himself within the "all-encompassing referential system of history."

APPENDIX 1 – PROFILER SOFTWARE

Profiler is a set of Perl scripts for analyzing successions of chords (in isolation or in comparison with other chord successions) in any tonal or non-tonal triadic pieces. It is distributed under the GNU General Public License, version 3.

Generally, Profiler will analyze a succession of chordal roots and generate a chord-root probability profile, a root-progression probability profile, and tables of correlation coefficients between those profiles, though there are other functions listed below. Profiler was developed as part of this dissertation research on harmonic syntax in György Ligeti's triadic music.

Profiler is a collection of 15 scripts, but there are two main scripts: *profiler.pl* and *correlate.pl*. *profiler.pl* will take a succession of chords in a CSV file (or multiple CSV files at once) and generate 1) a CSV file containing the chord-progression succession (i.e., the intervals between each chord root), 2) a CSV file containing the zeroth-order probabilities for all 12 chord root pitch classes, and 3) a CSV file containing the zeroth-order probabilities for all 12 root-to-root intervals. Profiler comes with empty folders for storing and organizing these files, but if those folders are absent, it will create them for you. *correlate.pl* will take all the chord-root profiles and calculate Pearson and Spearman (rank) correlation coefficients between all profile pairs, and will then do the same for the root-progression profiles.

Due to the nature of the analysis for which I developed profiler, all chord-root information uses the integers 0–11 to refer to the twelve pitch classes C–B. All root-progression information, however, is measured in perfect fifths (0 = unison, 1 = perfect fifth, 2 = two fifths or a whole tone, 3 = three fifths or a major sixth, etc.). This may seem counter-intuitive . . . until you look at the profiles generated by tonal and pre-tonal works!

The file format for the initial chord succession file is very simple. The Profiler scripts will take any CSV file with UNIX-friendly line breaks (you may need to do a quick conversion in a text editor like Text Wrangler if you created the CSV file with a standard spreadsheet application), and it will look only at the data on each line which precedes the first comma. That data should be one of the following:

```
0 1 2 3 4 5 6 7 8 9 10 11 q x
```

Any other numbers or characters will return an error. Currently, Profiler will not process q and x, but they are there for future processing of things like single tones, dyads, or dissonant sonorities. Any integer 0–11 will be counted toward the chord-root probability profile, but only progressions between two integers will be counted in the root-progression succession and profile. In the future, I hope to have additional scripts which will process information after the first comma (such as chord quality), but for now Profiler ignores it.

All scripts (except for *correlate.pl*) are run by navigating to the proper folder and entering the following terminal command:

```
./scriptName.pl FolderName/filename.csv
```

correlate.pl automatically takes all files in the relevant folder, so you can simply enter:

```
./correlate.pl
```

Additionally, Profiler includes the following scripts:

chordsToProfile.pl — takes a CSV file containing a succession of chords and produces a CSV file containing the chord-root probability profile (component of *profiler.pl*).

chordsToProgs.pl — takes a CSV file containing a succession of chords and produces a CSV file containing the corresponding succession of root-to-root intervals (component of *profiler.pl*).

progsToProfile.pl — takes a CSV file containing a succession of root-progressions and produces a CSV file containing the root-progression probability profile (component of *profiler.pl*).

profilesToSpreadsheet-roots.pl — takes the chord-root probability profiles of the invoked files and compiles a single CSV file containing all profiles, useful for creating multiple graphs quickly (component of *profiler.pl*).

profilesToSpreadsheet-progressions.pl — takes the root-progression probability profiles of the invoked files and compiles a single CSV file containing all profiles, useful for creating multiple graphs quickly (component of *profiler.pl*).

pearsonCorrelations-roots.pl — takes the chord-root probability profiles of the invoked files and generates a CSV file containing the Pearson correlation coefficient between every pair of probability profiles (component of *correlate.pl*).

pearsonCorrelations-progressions.pl — takes the root-progression probability profiles of the invoked files and generates a CSV file containing the Pearson correlation coefficient between every pair of probability profiles (component of *correlate.pl*).

SpearmanCorrelations-roots.pl — takes the chord-root probability profiles of the invoked files and generates a CSV file containing the Spearman (rank) correlation coefficient between every pair of probability profiles (component of *correlate.pl*).

SpearmanCorrelations-progressions.pl — takes the root-progression probability profiles of the invoked files and generates a CSV file containing the Spearman (rank) correlation coefficient between every pair of probability profiles (component of *correlate.pl*).

profileToRandomSequence.pl — takes a chord-root probability profile and generates a random succession of 10,000 chords with the same relative chord-root distribution.

transpose.pl — takes a chord-root probability profile and generates all twelve transpositions of that profile, useful for finding which transposition is best for comparison with some other profile.

rawToProb-roots.pl — takes a raw tally of chords built on each of the 12 pitch-class roots and generates a probability profile (sum 1).

rawToProb-progressions.pl — takes a raw tally of each of the 12 root intervals found in a succession of root progressions and generates a probability profile (sum 1).

APPENDIX 2 – BACH CHORALES PROGRESSION TOTALS BY ROOT INTERVAL AND CHORD QUALITY

ma = major; mi = minor; di = diminished;
D7 = dominant seventh; J7 = major seventh; n7 = minor seventh; h7 = half-diminished seventh

Root interval	Quality of first chord	Quality of second chord	Total
0	D7	D7	16
0	D7	ma	68
0	di	D7	1
0	di	di	17
0	di	h7	12
0	di	ma	1
0	di	mi	6
0	di	n7	2
0	h7	di	6
0	h7	h7	5
0	J7	D7	1
0	J7	ma	42
0	ma	D7	1396
0	ma	di	3
0	ma	J7	511
0	ma	ma	1150
0	ma	mi	59
0	ma	n7	1
0	mi	D7	12
0	mi	di	23
0	mi	h7	3
0	mi	ma	16
0	mi	mi	482
0	mi	n7	479
0	n7	D7	1
0	n7	h7	5
0	n7	mi	24
0	n7	n7	3
1	D7	J7	1
1	D7	ma	91
1	di	J7	3
1	di	ma	496
1	di	mi	232
1	h7	D7	1
1	h7	J7	1
1	h7	ma	173
1	h7	mi	8
1	ma	di	2
1	ma	h7	2

Root interval	Quality of first chord	Quality of second chord	Total
1	ma	J7	2
1	ma	ma	30
1	mi	D7	1
1	mi	di	1
1	mi	J7	37
1	mi	ma	85
1	n7	J7	6
1	n7	ma	94
2	D7	D7	23
2	D7	di	3
2	D7	h7	4
2	D7	ma	36
2	D7	mi	130
2	D7	n7	3
2	di	di	14
2	h7	D7	1
2	h7	di	19
2	J7	D7	70
2	J7	ma	161
2	J7	mi	85
2	J7	n7	13
2	ma	D7	237
2	ma	di	2
2	ma	h7	8
2	ma	ma	138
2	ma	mi	208
2	ma	n7	329
2	mi	D7	39
2	mi	di	73
2	mi	h7	259
2	mi	ma	149
2	mi	mi	46
2	mi	n7	11
2	n7	D7	16
2	n7	di	74
2	n7	h7	39
2	n7	ma	57
2	n7	mi	42
2	n7	n7	1
3	di	D7	1
3	di	di	3
3	di	mi	100
3	di	n7	36
3	h7	mi	63
3	h7	n7	13
3	J7	di	2
3	ma	D7	1

Root interval	Quality of first chord	Quality of second chord	Total
3	ma	di	2
3	ma	ma	11
3	ma	mi	1
3	mi	D7	44
3	mi	di	1
3	mi	J7	108
3	mi	ma	218
3	mi	n7	2
3	n7	D7	34
3	n7	di	3
3	n7	J7	13
3	n7	ma	58
4	D7	di	28
4	D7	h7	5
4	D7	mi	1
4	di	ma	1
4	di	mi	6
4	J7	D7	1
4	J7	ma	1
4	J7	mi	14
4	J7	n7	3
4	ma	D7	16
4	ma	di	84
4	ma	h7	30
4	ma	ma	31
4	ma	mi	145
4	ma	n7	166
4	mi	D7	1
4	mi	di	3
5	D7	D7	4
5	D7	h7	1
5	D7	J7	13
5	D7	ma	1162
5	D7	mi	517
5	di	D7	4
5	di	h7	1
5	di	ma	21
5	di	mi	10
5	di	n7	17
5	h7	D7	37
5	h7	ma	171
5	h7	mi	11
5	h7	n7	4
5	J7	J7	10
5	J7	ma	124
5	ma	D7	26
5	ma	J7	101

Root interval	Quality of first chord	Quality of second chord	Total
5	ma	ma	1333
5	ma	mi	565
5	mi	D7	116
5	mi	di	3
5	mi	ma	138
5	mi	mi	140
5	mi	n7	118
5	n7	D7	78
5	n7	ma	269
5	n7	mi	154
5	n7	n7	57
6	D7	di	57
6	di	J7	1
6	di	ma	5
6	di	mi	1
6	h7	di	3
6	h7	J7	1
6	h7	ma	5
6	J7	D7	3
6	J7	di	69
6	J7	h7	23
6	J7	ma	1
6	J7	mi	2
6	ma	di	76
6	ma	h7	217
6	ma	ma	2
6	mi	di	8
6	mi	h7	3
6	n7	di	1
7	D7	mi	13
7	D7	n7	5
7	di	h7	1
7	di	ma	11
7	di	mi	9
7	h7	h7	2
7	h7	mi	1
7	J7	D7	2
7	J7	ma	7
7	ma	D7	90
7	ma	h7	3
7	ma	J7	5
7	ma	ma	673
7	ma	mi	66
7	ma	n7	5
7	mi	D7	38
7	mi	di	7
7	mi	ma	305

Root interval	Quality of first chord	Quality of second chord	Total
7	mi	mi	189
7	mi	n7	7
7	n7	D7	2
7	n7	di	14
7	n7	mi	15
7	n7	n7	2
8	di	D7	26
8	di	ma	14
8	h7	D7	20
8	h7	ma	10
8	ma	di	16
8	ma	h7	1
8	ma	ma	20
8	mi	D7	1
8	mi	di	1
8	mi	J7	20
8	mi	ma	228
8	n7	D7	1
8	n7	J7	16
8	n7	ma	83
8	n7	mi	1
9	D7	D7	7
9	D7	di	3
9	D7	ma	22
9	D7	mi	36
9	D7	n7	63
9	di	di	1
9	h7	di	19
9	h7	h7	5
9	J7	D7	1
9	J7	ma	9
9	J7	mi	128
9	J7	n7	28
9	ma	D7	18
9	ma	di	4
9	ma	ma	59
9	ma	mi	347
9	ma	n7	88
9	mi	D7	1
9	mi	di	260
9	mi	h7	53
9	n7	D7	1
9	n7	di	62
9	n7	h7	45
9	n7	ma	2
9	n7	mi	3
9	n7	n7	1

Root interval	Quality of first chord	Quality of second chord	Total
10	D7	ma	14
10	D7	mi	6
10	di	D7	2
10	di	ma	21
10	di	mi	49
10	h7	D7	3
10	h7	ma	18
10	h7	mi	58
10	ma	ma	90
10	ma	mi	8
10	mi	D7	18
10	mi	ma	242
10	mi	mi	34
10	mi	n7	3
10	n7	D7	22
10	n7	ma	64
10	n7	mi	5
11	di	ma	8
11	J7	h7	12
11	J7	ma	1
11	J7	mi	4
11	ma	D7	3
11	ma	di	70
11	ma	h7	4
11	ma	ma	13
11	ma	mi	40
11	ma	n7	23
11	mi	di	60
11	n7	di	2

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