**Materials and Methods**

**Data**

We collected vessel landings tickets for all commercial landings on the US west-coast between 2006-2014 from the Pacific Fisheries Information Network (PacFIN) database (www.psmfc.org). These commercial landings accounted for approximately 2.7 million metric tons of 228 species, resulting in 3.7 billion dollars in revenue (adjusted to 2009 levels) by a total of 6,862 vessels. We discard any fisheries for which vessel identifying information is unavailable, which precludes analysis of patterns of individual participation. This primarily affects bivalve fisheries (i.e. pacific oyster and geoduck fisheries in Washington).

**Date preparation**

To examine patterns of participation, we grouped landings into distinct fisheries. Fisheries are defined as harvest assemblages caught with a specific gear (van Putten et al. 2012; Boonstra and Hentati Sundberg 2014). The Pacific Fisheries Management Council (PFMC) has developed a set of sector-based definitions similar to this approach for the federally managed groundfish landings (www.pcouncil.org), but no equivalent exists for non-groundfish fisheries {NorthwestFisheriesScienceCenter:vj}. In order to treat the landings dataset uniformly, we applied a métier analysis to this landing data (Deporte et al. 2012) to build a set of fisheries, see Fuller et al. 2017 for more details.

**Constructing Participation Networks**

Fisheries are linked by fisher-mediated interactions. If a vessel *k* fishes in two fisheries *i* and *j*, they are linked in vessel *k*’s yearly strategy. Thus changes in fishery *i* can change the cost-benefit decisions for vessel *k* fishing in fishery *j*. The weight of the interaction between the two fisheries is determined by the density of the vessel linkages between fishery *i* and *j*. For a vessel *k*,link density scales with the amount of total revenue derived between the two fisheries *Rijk* and the evenness with which the vessel that participates in both fisheries *i* and *j,* but the more fisheries vessel *k* participates in, the smaller contribution to each fishery. So each vessel contributes to the link weight between fishery *i* and *j*. This results in a fishery participation network

One limitation of using vessels as a proxy for individual fishermen is that it’s impossible to know if vessels changed hands. With a short enough time series, the risk of this might be slight, but with 8 years of data, it’s probable that at least some vessels were transferred. This is especially likely because some major changes occurred (i.e. the chinook salmon troll fishery closed and the general recession in 2008-2009; implementation of individual-transferable quotas in groundfish trawl fishery in 2011). If a vessel might change targeting and participation based on permits, skill and gear that a new owner might provide. Grouping across years, and across possible transfers in those cases, would smear the patterns of participation and obscure common subsets of fisheries that co-occur. To address the problem of vessel-transfer, I split up vessels into vessel-year replicates.

Another concern is the timing of seasonal fisheries and the calendar year. Dungeness crab is one of the most lucrative fisheries on the west coast, and it occurs over the winter. Thus using calendar years bisects the fishing season. To better reflect the rhythm of a fishing year, I also break vessel-year replicates at the end of October (after the finish of the summer crab fishing, before the start of end of the following years crab opener as early as late November. Therefore crab-year is defined by assigning spring and summer trips before Oct 31 with the previous year. So Jan-Oct 2008 trips are assigned 2007. This also helps because 2015 crab data wasn’t reported. So should go through 2014 as a ‘complete’ season.

**Calculating Resilience**

Using the universal resilience function from Gao {\*Gao:2016dn}, we calculated , where is the network density (number of connections connected divided by the number of total possible connections), is the edge symmetry (here, because networks are unweighted, symmetry is equal to one) and is the edge heterogeneity measured as the standard deviation in edge weights {Gao:2016dn}.