```cpp
/*
Write a short C++ program that takes two arguments of type STL vec-
tor<double>, a and b, and returns the element-by-element product of a
and b. That is, it returns a vector c of the same length such that c[i] =
a[i] · b[i].
*/


#include <iostream>
#include <vector>

using namespace std;

std::vector<double> vecProduct(const std::vector<double>& v1, const
    std::vector<double>& v2) {
    // Your code here
    // Return empty vector if v1 and v2 are of different sizes;

    std::vector<double> c;

    if (v1.size() != v2.size())
    {
        cout << "Both vectors must be the same size";
    }
    else
    {
        for (int i = 0; i <= v1.size(); i++)
        {
            c.push_back(v1[i] * v2[i]);
        }
        return c;
    }
}

// Overload << operator to print std::vector
std::ostream& operator <<(std::ostream& os, const std::vector<double>& v) {
    for (int i = 0; i < v.size(); i++) {
        os << v.at(i) << " ";
    }
    os << std::endl;
    return os;
}
// Test
int main() {
    // Test 1
    std::vector<double> v1{ 1.0, 2.0, 3.0 };
    std::vector<double> v2{ 4.0, 5.0, 6.0 };
    std::vector<double> v3 = vecProduct(v1, v2);
    std::cout << v3; // Should print 4, 10, 18
```

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50      // Test 2
51      std::vector<double> v4{ 42.0 };
52      std::cout << vecProduct(v1, v4); // Should print empty vector
53  }
54
```