The 1-link robotic manipulator dynamics can be written from using the dynamics of the 3-link robotic manipulator as

This can be written parameter regressor form as

The parameters can be written as

The matrices can then be rewritten using the parameters as

If we take away the gravitational terms from the dynamics, there are only three parameters that need to be estimated

In equation form the dynamics are written as

Without gravity it can be written as

With all this written, the regressor matrix can then be written as

Without the gravitational terms, the regressor matrix can be written as

If using passivity-based control then the control can be given as

or

Where

In equation form the dynamics are written as

Without gravity it can be written as

Then the regressor matrix can be re-written as

Without the gravitational terms, the regressor matrix can be written as

If using the regular non-passivity-based control, then the control designer must have feedback information on the angular acceleration for each link.