Laser welded sandwich plates with web-core have found their position in the marine and land vehicles. To implement such design accurately, knowledge about the influence of geometrical parameters on the stiffness is necessary. In this paper, the over-hanging three points bending tests were performed on the laser welded web-core steel sandwich plate under quasi-static conditions, together with the finite element (FE) simulations. The following parameters were analysed: the thickness of the face plate, the spacing of the two core plates and the height of the core plates. The agreement between experimental measurements and FE results was considered to be good. It is shown that changes of these parameters can contribute to increase or decrease of the stiffness of web-core sandwich plate, but the height of the core plate has no effect on the shear stiffness as the spacing of the two core plates is known. There are linear, exponential and polynomial fitted relationships between the geometrical and the stiffness of the web-core sandwich plates.